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Survey of Offshore Escape, Evacuation & Rescue Safety Systems

(Post *Ocean Ranger* Recommendations)

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Survey of Offshore Escape, Evacuation & Rescue Safety Systems

(Post *Ocean Ranger* Recommendations)

By

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Safety First Industrial Safety Services

March 2006

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16. Abstract

This study, supported by an interview process, reviewed existing documents to ascertain the current status of government and industry actions arising from the recommendations of the Royal Commission on the Ocean Ranger Marine Disaster (RCOMD) published in reports in 1984 and 1985. The study identified 31 of the 136 recommendations as having direct relevance to Escape, Evacuation and Rescue.

The study has examined over 100 examples of the research and development stemming from the RCOMD recommendations and covering six areas: Technology, Regulation, Standards, Procedures, Personnel Training and Communication. Communication represents acknowledgement of the research projects where information regarding the EER research advances was located in journals and conference papers, but could not be otherwise validated.

The documentation revealed that all 31 recommendations have received an initial response from government and/or industry, and the vast majority of those recommendations stimulated continuing EER research.

All of the technology aims of the RCOMD recommendations have received ongoing attention, whereas some of the procedural and personnel training issues initially received response, which subsequently ceased. These areas do not constitute a direct hazard to offshore safety and are considered by the offshore energy industry to be addressed through internal protocols.

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16. Résumé

Cette étude, qui s'est appuyée sur des contacts avec des acteurs du milieu, a consisté à examiner des documents existants afin de faire le point sur les mesures prises par le gouvernement et l'industrie dans la foulée des recommandations formulées dans les rapports de la Commission royale d'enquête sur le désastre marin de l'Ocean Ranger (CREDMO), parus en 1984 et en 1985. Parmi les 136 recommandations, l'étude en a identifié 31 qui se rapportaient directement aux opérations de secours, d'évacuation et de sauvetage.

Les chercheurs ont examiné plus de 100 projets de recherche et développement parmi tous ceux entrepris à la suite des recommandations de la CREDMO et couvrant six secteurs : technologie, réglementation, normes, procédures, formation du personnel et communications. Dans le secteur «communications» entrent les projets de recherche «documentaire», qui relaient l'information sur les percées de la recherche SES (secours, évacuation et sauvetage) publiée dans des revues spécialisées et des comptes rendus de conférences, sans que cette information puisse être validée par ailleurs.

La documentation examinée a révélé que les 31 recommandations ont suscité une première réaction de la part du gouvernement et/ou de l'industrie, et que la grande majorité de ces recommandations ont déclenché des travaux de recherche de longue haleine dans le domaine SES.

Toutes les recommandations de nature technologique formulées par la CREDMO ont reçu une attention soutenue, tandis que certaines de celles qui touchaient les procédures et la formation du personnel ont provoqué une réaction initiale qui n'a pas connu de suite. Ces deux secteurs ne constituent pas une menace directe à la sécurité en mer et ils sont considérés par l'industrie énergétique en mer comme devant être régis par des protocoles internes.

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In a work of this nature, where many of the reference documents and publications are over twenty years old, acquiring selected records has proven most challenging. The author wishes to extend his acknowledgement and gratitude to those individuals and organizations, too numerous to acknowledge individually, that contributed their knowledge and materials to the development of this project's scope of information.

The records library of the Canadian Association of Petroleum Producers (St. John's offices), and the extensive research papers and reports library and helpful staff of the Canada Institute for Scientific & Technical Information in St. John's were of particular assistance.

PROJECT TEAM

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EXECUTIVE SUMMARY

This survey of Offshore Petroleum Installation Escape, Evacuation and Rescue (EER) Safety Systems was initiated by Transport Canada, through the Transportation Development Centre. The scope of work focused primarily on a literature search for historical and current information regarding the implementation of research and development, regulatory change, policy/practice amendment and technological innovation in response to selected recommendations within the two reports published by the Royal Commission on the *Ocean Ranger* Marine Disaster (RCOMD).

This report presents the results of a literature-based investigation to determine the extent of research conducted on the escape, evacuation and rescue process for offshore installations since the loss of the Mobile Offshore Drilling Unit, *Ocean Ranger*, and her entire crew of 84 persons.

The Safety First Industrial Safety Services research team analyzed the 136 recommendations established by the RCOMD and identified 31 recommendations pertaining to EER. The research team established six categories into which the EER data would be sorted. Information on ongoing research activities was sought from both government and industry. Information on advances in EER within the following areas was sought:

- Technology,
- Regulation,
- Standard,
- Procedures / Practices, and
- Personnel / Training,
- Communication, the sixth category, includes documentation used to communicate the existence and results of the research to a broad audience; Communication includes journals, magazines, press releases, research summaries, and other similar documents.

To facilitate the data collection effort, the research team made a large number of initial contacts throughout the Canadian East Coast offshore energy community. Energy company associations, petroleum operators, drilling contractors, marine service companies, aviation service companies, and federal and provincial regulatory organizations as well as the two offshore petroleum boards were approached for information by way of a circular letter and direct contact.

The research team also established contacts with manufacturers, service agencies and the professional research community external to the offshore community, the latter through the auspices of the Canadian Association of Petroleum Producers (CAPP) Sub-Committee on Research and Development.

The review was conducted by way of online and internet searches, visiting or contacting organizations known to have participated in research in the target areas, and by documentation research, conducted primarily through the National Research Council's Canada Institute for Scientific and Technical Information (CISTI).

The extensive library of research records held by Safety First Industrial Safety Services was augmented by information reviewed at the CAPP library in St. John's.

Just over 420 documents were reviewed and collated, representing some 8,000 pages of data. The information was initially divided into the six focus areas, and data verification commenced. Since it focused primarily on acquiring the original or a copy of the research materials, this element of the project was challenging as much of the pertinent work (and associated information) had been completed over 20 years ago and has been lost from institutional memory, as well as from research libraries and corporate files.

The analysis of the data indicates that government and industry have done a commendable job of implementing and maintaining the vast majority of the RCOMD EER recommendations and in some cases has gone beyond the recommendations.

Initially there was a direct response from both groups to all recommendations when the RCOMD reports were published – Report One in 1984 and Report Two in 1985. A significant amount of work in both practical field applications and research activities subsequently ensued.

The data does indicate that, in the areas where compliance with the specific wording of the recommendation is not followed, alternative approaches have been implemented such that there is no reduction in the safety protection of offshore personnel or operations. These areas of partial compliance include:

- The number of lifeboat crews assigned to emergency duties is one for each lifeboat. There are no designated "spare" crews (Recommendation 25); however, since all regular crew change personnel complete personal survival training prior to travelling offshore, each person has a basic knowledge of lifeboat controls and their function. Also, each lifeboat crew is comprised of two personnel, not four as put forward by the RCOMD (Recommendation 26).
- An area of ongoing industry concern is the RCOMD recommendation (and requirement in regulation) to launch all lifeboats at least twice per year, including at-sea installations (Recommendation 28). Industry organizations and the lifeboat crews view this intended practice as hazardous when at sea and the lifeboats are generally not launched to sea and manoeuvered in the offshore environment. The owners and crew of the offshore installations have put into place alternative methods of verifying readiness to launch. Lifeboat crews launch lifeboats at onshore training facilities every three years, when they recertify their "Survival Craft Leader" training.
- Industry has not adopted the concept of special recognition and incentives for the lifeboat crews (Recommendation 29), but has allocated the required resources to ensure that the Survival Craft Coxswains and crew maintain proficiency in accordance with the applicable training standards.
- The recommendation to upgrade the military Search and Rescue (SAR) helicopters was originally undertaken for in-service enhancements (SARCUP) but it has been only recently that new SAR aircraft have been procured.

- An omnibus act specific to mobile offshore drilling units and offshore installations was not specifically enacted (Recommendation 80). However the promulgation of the *Canada Oil and Gas Operations Act* and the establishment of regional offshore petroleum boards serve a similar function with regard to the safety of offshore activities, and particularly with respect to EER.
- Industry helicopters operating over the Grand Banks have "active-mode" rescue equipment available and substantial crew training was conducted. While the equipment was available in Nova Scotia, the proximity to a military air station with rescue support meant that the same level of implementation as in Newfoundland and Labrador was not required.

Conclusions and recommendation for each of the categories of information were developed, and most significant for each category are as follows:

General Research:

Conclusion: Industry and government communication with the research community is improving. Initiatives such as the Petroleum Research Atlantic Canada organization are working.

Recommendation Government and industry should maintain close and effective information sharing with the research community.

Technology:

Conclusion: EER research continues to focus on fixing "last year's" problems. The primary EER research cycle appears to be principally focused on trying to make incremental changes to improve what went wrong last time, instead of exploring new approaches.

Recommendation: A series of recommended avenues is presented, including research into better potential use of helicopter assets, structural enhancements to develop a more survivable Temporary Safe Refuge so that marine evacuation is not the inevitable choice, and focus on direct transfer to an attendant vessel instead of entering the sea where the probability of survival is lower.

Regulation:

Conclusion: Prescriptive EER regulation has slowed the development and implementation of innovative EER approaches. Current regulation is dated and cannot accommodate the speed of technological change.

Recommendation: Government should consider which areas of offshore regulation might benefit from the implementation of a goal-setting performance based approach.

Standards:

Conclusion: A number of valid international performance standards approved for use in other offshore jurisdictions are not accepted for use in Canada.

Recommendation: Regulators should consider a process of review and reasoned acceptance of selected international standards, regardless of their country of origin.

Procedures:

Conclusion: Industry EER procedures and practices have improved substantially since the loss of the *Ocean Ranger* and crew.

Recommendation: The contractor's research team for this area proposes no recommendations.

Personnel / Training:

Conclusion: The EER training of the current generation of offshore worker has been successful. Modern adult learning theory indicates that the replacement generation of offshore workers has a different learning pattern.

Recommendation: Industry should carry out research to establish that the currently successful EER training approach can be adjusted to achieve the same effectiveness with a new generation of workers.

SOMMAIRE EXECUTIF

Cet examen des systèmes de secours, d'évacuation et de sauvetage (SES) des installations pétrolières en mer a été lancé par Transports Canada et réalisé sous les auspices du Centre de développement des transports. La portée des travaux a consisté en une recherche documentaire (dans un corpus récent et plus ancien) sur la mise en œuvre de travaux de R&D, la modification de règles, principes directeurs et méthodes, et les innovations technologiques entreprises pour donner suite à certaines des recommandations formulées dans les deux rapports publiés par la Commission royale d'enquête sur le désastre marin de l'*Ocean Ranger* (CREDMO).

Ce rapport présente les résultats d'une recherche documentaire qui a porté sur l'étendue des études effectuées sur les procédures de secours, d'évacuation et de sauvetage pour les installations en mer depuis la perte de l'unité mobile de forage en mer *Ocean Ranger*, et des 84 membres de l'équipage.

L'équipe de recherche de Safety First Industrial a analysé les 136 recommandations formulées par la CREDMO et en a retenu 31 se rapportant aux opérations SES. Elle a créé six catégories pour le classement des données SES. L'information sur les activités de recherche en cours émane autant du gouvernement que de l'industrie. Il a donc été possible de colliger de l'information sur les percées réalisées en matière de SES dans les six secteurs suivants :

- Technologie
- Réglementation
- Normes
- Procédures / pratiques
- Formation du personnel
- Communications – Cette sixième catégorie comprend les documents qui visent à communiquer les résultats de travaux de recherche à un vaste public; ces documents comprennent les revues, les magazines, les communiqués de presse, les sommaires de recherche et d'autres documents semblables.

Pour colliger ces données, l'équipe de recherche a commencé par établir de nombreux contacts dans l'industrie énergétique en mer de la côte est du Canada. Des associations industrielles du secteur de l'énergie, des pétrolières, des entrepreneurs en forage, des sociétés maritimes, des sociétés aériennes et des organismes de réglementation fédéraux et provinciaux, de même que deux offices des hydrocarbures extracôtiers ont été sollicités au moyen d'une lettre circulaire et de contacts directs.

L'équipe de recherche a aussi établi des contacts avec des fabricants, des organismes de services et le milieu de la recherche gravitant autour des sociétés exploitantes; dans ce cas, les contacts ont été établis par le truchement du sous-comité de la recherche-développement de l'Association canadienne des producteurs pétroliers (ACPP).

L'étude a été menée au moyen de recherches par téléréférence et Internet, de rencontres ou de contacts avec des organisations connues pour avoir participé à des recherches dans les domaines d'intérêt, et d'une recherche documentaire menée principalement avec l'aide de l'Institut canadien de l'information scientifique et technique (ICIST) du Conseil national de recherches du Canada.

La vaste bibliothèque de documents de recherche de Safety First Industrial a été mise à profit, de même que la bibliothèque de l'ACPP, située à St. John's.

Un peu plus de 420 documents ont été recensés et colligés, représentant quelque 8 000 pages de données. Cette information a d'abord été classée en six grandes catégories, puis la vérification des données a commencé. On tentait d'obtenir l'original ou une copie de chaque document de recherche. Cela s'est révélé difficile car beaucoup des recherches pertinentes (et des données connexes) dataient de plus de 20 ans et avaient donc disparu de la mémoire institutionnelle, de même que des bibliothèques de recherche et des dossiers des entreprises.

L'analyse des données indique que le gouvernement et l'industrie ont déployé des efforts louables pour donner suite à la plupart des recommandations de la CREDMO concernant le secours, l'évacuation et le sauvetage. Dans certains cas, on est même allé au-delà des recommandations.

Le gouvernement et l'industrie ont d'abord répondu directement à toutes les recommandations formulées dans les rapports de la CREDMO au moment de leur parution : le premier en 1984 et le deuxième en 1985. Par la suite, ils ont mené des travaux importants tant dans le domaine des applications pratiques que dans celui de la recherche.

L'information recueillie indique de fait que lorsque la recommandation n'a pas été suivie à la lettre, des mesures de rechange ont été appliquées, de manière à ne pas compromettre la sécurité des opérations en mer ou du personnel affecté à ces opérations. Les recommandations auxquelles il n'a été donné suite que partiellement sont les suivantes :

- Le nombre d'équipes de manœuvre des bateaux de sauvetage que l'on trouve à bord des unités de forage est d'une pour chaque bateau de sauvetage. Il n'y a pas d'équipe «supplémentaire» (comme le préconise la recommandation 25); toutefois, comme tous les effectifs réguliers de relève reçoivent une formation sur la survie en mer avant de se rendre travailler à bord de l'unité de forage, chaque membre du personnel a une connaissance de base de la manœuvre et de l'utilisation des bateaux de sauvetage. De plus, l'équipe de manœuvre des bateaux de sauvetage est composée de deux membres plutôt que quatre, comme le préconise la CREDMO (recommandation 26).

- Une des recommandations de la CREDMO (et l'exigence correspondante dans la réglementation) demeure une source de préoccupation pour l'industrie, soit celle qui voudrait que l'on procède au lancement et à l'utilisation de tous les bateaux de sauvetage au moins deux fois par année, notamment à partir des installations en mer (recommandation 28). Les entreprises et les équipages des installations en mer considèrent dangereuse cette pratique recommandée (de lancement en pleine mer), et de fait, les exercices ont rarement lieu en mer. Les propriétaires et les équipages des unités de forage ont mis en place d'autres méthodes pour valider la compétence des équipes de manœuvre des bateaux de sauvetage. Les membres des équipes de manœuvre des bateaux de sauvetage procèdent tous les trois ans à la mise à l'eau des bateaux de sauvetage dans des installations de formation à terre, lors de leur formation pour le renouvellement de leur accréditation.

- L'industrie n'a pas adopté le concept de reconnaissance spéciale et d'incitations pour entériner l'importance des membres des équipes de manœuvre des bateaux de sauvetage (recommandation 29), mais elle a affecté les ressources nécessaires pour garantir que les capitaines et les membres des équipes de manœuvre des bateaux de sauvetage maintiennent leur niveau de compétence conformément aux normes de formation en vigueur.

- La recommandation d'améliorer les hélicoptères militaires de Recherche et Sauvetage (SAR) a d'abord été appliquée sous forme d'améliorations en service (SARCUP), mais ce n'est que récemment que de nouveaux aéronefs SAR ont été achetés.

- Aucune loi «omnibus» portant spécifiquement sur les unités mobiles de forage en mer et les installations extracôtières n'a été adoptée (recommandation 80). Toutefois, l'adoption de la *Loi sur les opérations pétrolières au Canada* et l'établissement d'offices régionaux des hydrocarbures extracôtiers jouent un rôle semblable en ce qui a trait à la sécurité des activités en mer, et en particulier aux opérations de secours, d'évacuation et de sauvetage

- Les hélicoptères retenus par contrat par l'industrie qui survolent les Grands bancs transportent un matériel de sauvetage en «mode actif» et les équipages de ces aéronefs ont reçu une formation poussée. En Nouvelle-Écosse, les hélicoptères étaient munis du matériel de sauvetage, tandis qu'à Terre-Neuve-et-Labrador, la proximité d'une station aérienne militaire dotée de ressources de sauvetage ne rendait pas cette mesure nécessaire.

Des conclusions ont été élaborées et des recommandations formulées pour chacune des catégories d'information. Les plus importantes pour chaque catégorie se lisent comme suit :

Recherche générale :

Conclusion : Les communications entre l'industrie et le gouvernement, d'une part, et le milieu de la recherche, d'autre part, s'améliorent. Des initiatives comme l'organisme *Petroleum Research Atlantic Canada* fonctionnent bien.

Recommandation : Que le gouvernement et l'industrie maintiennent un échange soutenu et efficace d'information avec le milieu de la recherche.

Technologie :

Conclusion : La recherche SES tente encore de résoudre les «problèmes du passé». Le cycle primaire de recherche SES semble se concentrer sur les choses à changer pour remédier à ce qui n'a pas fonctionné dans le passé, plutôt que d'explorer de nouvelles approches.

Recommandation : Un éventail de recommandations est présenté, dont les suivantes : faire une meilleure utilisation des hélicoptères, améliorer la structure de la zone de refuge temporaire pour qu'elle permette une meilleure survie et que l'évacuation en mer ne soit pas la seule solution, et privilégier le transfert direct à un navire de soutien plutôt qu'une évacuation en mer, qui offre moins de chances de survie.

Réglementation :

Conclusion : La réglementation normative en matière de SES a ralenti le développement et la mise en œuvre d'approches novatrices de SES. La réglementation actuelle date et elle ne suit pas le rythme des changements technologiques.

Recommandation : Que le gouvernement examine quels secteurs de la réglementation des activités en mer pourraient bénéficier de la mise en œuvre d'une approche fondée sur la définition d'objectifs et des normes de performance.

Normes :

Conclusion : Il existe des normes de performance internationales valides, homologuées à l'étranger, qui ne sont pas acceptées pour être appliquées au Canada.

Recommandation : Que les organismes de réglementation envisagent un processus d'examen et d'acceptation raisonnée de normes internationales choisies, sans égard au pays dont elles proviennent.

Procédures :

Conclusion : Les procédures et pratiques appliquées par l'industrie en matière de SES se sont considérablement améliorées depuis la perte de l'*Ocean Ranger* et de son équipage.

Recommandation : Aucune recommandation n'a été formulée par l'équipe de recherche du contractant.

Personnel/Formation :

Conclusion : La formation SES de la génération actuelle des travailleurs des installations en mer a été une réussite. Selon la théorie moderne de l'apprentissage des adultes, la prochaine génération de travailleurs aura un mode d'apprentissage différent.

Recommandation : Que l'industrie mène des recherches pour voir s'il est possible de modifier la méthode actuelle de formation SES pour qu'elle soit aussi efficace avec une nouvelle génération de travailleurs.

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GLOSSARY

ACPI	Atlantic Canada Petroleum Institute (now PRAC)
APOA	Arctic Petroleum Operators' Association (now CAPP)
BOST	Basic Offshore Survival Training, Newfoundland/Labrador (now BST)
BOT	Basic Offshore Training, Nova Scotia (now BST)
BST	Basic Survival Training
CAODC	Canadian Association of Oilwell Drilling Contractors
CAPP	Canadian Association of Petroleum Producers
CISTI	Canada Institute for Scientific and Technical Information
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
C-NSOPB	Canada-Nova Scotia Offshore Petroleum Board
COGLA	Canada Oil and Gas Lands Administration
CPA/OOD	Canadian Petroleum Association / Offshore Operators Division (now CAPP)
DFO/CCG	Department of Fisheries and Oceans / Canadian Coast Guard
DND	Department of National Defence
EER	Escape, Evacuation and Rescue offshore emergency paradigm
EPOA	East Coast Petroleum Operators' Association (now CAPP)
IMD	Institute for Marine Dynamics, at MUN (now IOT)
IOT	Institute of Ocean Technology (part of NRC)
JRCC	Joint Rescue Coordination Centre, Halifax (lodger unit in CFB Halifax)
MODU	Mobile Offshore Drilling Unit
MUN	Memorial University of Newfoundland
NEB	National Energy Board
NRCC	National Research Council Canada
PERD	Panel on Energy Research and Development (now Program of ERD)
PRAC	Petroleum Research Atlantic Canada
RCOMD	Royal Commission on the *Ocean Ranger* Marine Disaster
SAR	Search and Rescue
TDC	Transportation Development Centre (part of Transport Canada)
TQG	East Coast Offshore Petroleum Industry Training & Qualifications Guide

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1. INTRODUCTION

In the early morning hours of February 15, 1982, in a North Atlantic winter storm, the Mobile Offshore Drilling Unit *Ocean Ranger* capsized and sank, with the loss of all persons onboard.

Up to that February morning, the Canadian offshore petroleum industry with operations on the East Coast of Canada, in the Canadian Beaufort Sea and in the waters of the Great Lakes, had conducted its activities for many years without experiencing a loss of life of such magnitude.

The causes of the *Ocean Ranger* marine disaster were investigated and evaluated within the two reports compiled by the Royal Commission on the *Ocean Ranger* Marine Disaster (RCOMD), jointly established by the Governments of Canada and Newfoundland. Report One (Volume 1) was published in August 1984 and Report Two (Volumes 2, 3 and 4) was published in June 1985.

The work of the Royal Commission was far-ranging, establishing not only the immediate causes of the sinking, but also assessing the preparedness of the Canadian East Coast offshore petroleum industry and the responsible regulatory authorities administering the offshore activities in order to avert another such tragic loss.

Volume 1 (The Loss of the Semisubmersible Drill Rig *Ocean Ranger* and its Crew) contained 66 recommendations. Volume 2 (Safety Offshore Eastern Canada) contained a further 70 recommendations. These 136 recommendations involved technologies, training, preparedness, regulation, command structure and other elements of East Coast offshore petroleum activities that were felt by the RCOMD to have contributed to the sinking of the *Ocean Ranger*, as well as actions felt appropriate to improve upon the overall capability to avert similar loss in the future.

The offshore industry did not wait for the reports of the Royal Commission to take action. In response to the immediate need to identify and implement improvements to the safety of offshore operations, the East Coast Petroleum Operators' Association (EPOA) and the Arctic Petroleum Operators' Association (APOA) established the Task Force on Offshore Safety. The Task Force investigated the status of offshore safety preparedness in the Canadian offshore areas and published its Report of the Offshore Safety Task Force in October 1983.

The Task Force identified a number of the recommendations that would later arise within the Royal Commission reports and by the time of the publication of RCOMD Report One, initial work by the East Coast offshore industry was already underway on the implementation of responses to a number of the critical issues.

The recommendations of the RCOMD immediately drew a supportive response from the regulatory authorities, agencies, and the offshore petroleum industry.

Within the early years following the completion of the work of the Royal Commission, there were focused research efforts put into place to improve both the operational and safety-oriented technologies used in the offshore industry. Much work was done jointly by government and industry associations, as well as independently by both parties, in conjunction with efforts made by individual companies.

In response to a request from Transport Canada in 2005, the Transportation Development Centre commissioned this study. The purpose of this study is to identify and report on actions taken by government and industry to implement those RCOMD recommendations pertaining to the Escape, Evacuation and Rescue elements of today's offshore activities.

This study considered the following questions:

- What was originally done in response to those specific recommendations of the Royal Commission?
- Have those actions initially implemented to respond to the specific recommendations been carried forward to today – some 24 years after the sinking of the *Ocean Ranger*?
- What improvements or enhancements to technologies, training, policy, practices, and regulation are in place today that continue to meet, or exceed, the original intent of those specific recommendations?
- In what areas should future activities be focused?

Previous work has been done by the regulator and industry in response to the Royal Commission's recommendations. This report respectfully acknowledges the investigations and research carried out by the federal government who developed an account of the response activities produced in April 1985, after the publication of the first of the Royal Commission reports, and after the five-year update produced in 1987. Since that time, much work has been conducted but not tracked in any formal way, which we hope this report will remedy.

The findings of this study are limited to those 31 recommendations dealing with the offshore issues of Escape, Evacuation and Rescue (EER). Much good work has been conducted on the other 105 recommendations as well, but that work is not the focus of this study.

2. APPROACH

2.1 Scope of Work

The statement of work issued by the Transportation Development Centre required a focus primarily on the actions taken to enhance the safety of offshore drilling units since the loss of the *Ocean Ranger.* The scope of work required a literature search for historical and current information regarding the implementation of research and development, regulatory change, policy/practice amendment and technological innovation in response to selected recommendations within the two reports of the Royal Commission on the *Ocean Ranger* Marine Disaster. The Scope of Work included the following requirements:

The mandate for this work stems from the recommendations of the Royal Commission on the *Ocean Ranger* Marine Disaster to require improvement in escape, evacuation and rescue (EER) systems. The EER terms of reference are derived from the Accord Act and its respective Offshore Petroleum Installation Regulations administered within the Canadian Exclusive Economic Zone by the provincial petroleum boards. The work addresses a number of safety, training and operational aspects of offshore oil and gas platform safety systems.

The primary circumstance that necessitates evacuation of an offshore installation is personnel safety in the event of the installation's loss of capacity to provide a safe haven, whether due to fire, loss of stability, or some other cause. Human factors and extreme environmental conditions increase risks further. In abandoning the installation, personnel must have access to an evacuation system and be able to embark and launch safely, clear and move away from the installation, and survive until rescued.

The objective of this project is to provide an update on the improvements to the safety regime of offshore petroleum installations proposed or implemented since the report of the Royal Commission on the *Ocean Ranger* Marine Disaster. The work involves an examination and evaluation of the regulatory, procedural and technical advances implemented by the Canadian authorities and the offshore industry to ensure greater safety of personnel.

This study examines the actions taken to enhance the safety of offshore drilling units since the loss of the *Ocean Ranger* and crew some 24 years ago. The work involves the collation and analysis of data pertaining to those legislative, organizational, and technological initiatives that have resulted in better training, technical advances, and organizational improvements to the safety regime of offshore petroleum installations.

The report addresses offshore installation safety technologies comprising EER systems and also includes the offshore installation safety improvements and the operational and procedural changes implemented since the publication of the report of the Royal Commission on the *Ocean Ranger* Marine Disaster.

2.2 Data Gathering

This study focuses primarily upon a literature search for historical and current information on research and development, regulatory change, policy/practice amendment and technological innovation in response to the subject specific recommendations contained within the two reports of the Royal Commission on the *Ocean Ranger* Marine Disaster.

The EER stakeholders were notified of the existence of this study at offshore industry research gatherings and focus meetings. The consultants interviewed selected parties through electronic mail. Direct personal interviews and telephone surveys were conducted with other parties.

The Royal Commission reports were reviewed and the recommendations of interest to this study were extracted and analyzed. Those 31 selected recommendations are included in APPENDIX A.

The research team developed parallel lines of investigation and conducted extensive document library research into the existence of confirmatory materials. Files on research activities were reviewed from public and private sources

Each information source and item of documentation was subjected to verification as far as could be reasonably done. Some of the reference materials pertain to activities conducted over 20 years ago and corroborative information is sparse in those cases.

Information was also gleaned from the extensive library files of Safety First Industrial Safety Services, which has maintained independent records of many early research and development activities conducted in response to the Royal Commission and the findings of the EPOA/APOA Offshore Safety Task Force.

2.3 Data Collation

The data collected involve a broad range of activities that supported the implementation of the RCOMD recommendations. For the purposes of forming the data into a meaningful report, a number of defining categories were developed. This will enable the reviewer to place the improvement into a context of why this topic was included, what party was interested in the anticipated outcome, and how this activity fits into the larger picture of "progress" when implementing the RCOMD recommendations. The data was assessed in terms of three main categories that were presented within the project Data Sheets (APPENDIX E):

Research Improvement: This category establishes the principal area of impact of the work under analysis. While research and development is the preferred mechanism for improving the tools and technologies (Technology) within the EER context, other assessment mechanisms must include:

- the regulatory environment required to accept such an improvement (Regulation),

- the performance standards by which the effectiveness of the improvement is appraised (Standard),
- the working environment within which the end user applies the technology, as defined by corporate policy and operational procedures (Procedures),
- the people who would be required to adapt to new technologies, learn new knowledge or practice new skills to ensure successful implementation (Personnel / Training),
- dissemination of the information to all parties who may improve their personal or organizational capabilities to provide a safer working environment (Communication).

Organization: This category establishes the main proponents of the work under analysis. This report has attempted to identify which types of organizations were the initiator (not always the sponsor) for any specific project.

For the purposes of this study, these organizations have been grouped as:

- Government (Regulators, Agencies, Boards)
- Industry (Petroleum companies or contractors, Commercial developers)
- Researchers (Academia / University)

Area of Impact: This category identifies the immediate area of regional or global impact of the results of the work under analysis. The two categories were:

- Canada (Eastern, Arctic, Inland)
- International (exterior to Canada)

3. RESULTS

As the major component of the data gathering was the literature review, there are no specific techniques to highlight regarding data acquisition. No new research methods were developed during this study to assist future researchers.

3.1 Selected *Ocean Ranger* Recommendations

A short summary of the 31 recommendations is provided from the RCOMD Report One and Report Two documents that correspond to the EER areas of interest. The full text for each of the selected recommendations is provided in APPENDIX A.

For the purposes of organizing the data for this report, Table 1 identifies the general areas of interest into which the recommendations have been assigned by the project team, allowing us to focus our data gathering efforts in specific areas. This arrangement of data does not indicate that the RCOMD assigned specific responsibility to any particular party to take the recommended action.

Table 1 *Ocean Ranger* Recommendations – Response Status

Topic	Recomm. Number	Remarks
Specific Government or Regulatory Action	20	Regulatory authority require an analysis of critical systems for emergencies.
	22	Canadian authorities consider development of adequate evacuation system for storm seas.
	30	Regulation developed to have drilling contractors identify onboard lifeboat men.
	45	Standby vessels to have restrictions on cargo before accepting the standby role.
	50	RCC (now JRCC) Halifax have all relevant records for offshore operations for retrieval in an emergency.
	53	Canada to complete its SARCUP program for the upgrade of its SAR helicopters.
	80	Enact an omnibus act specific to MODUs and offshore operations.
	111	Regulatory authority publish performance standards for standby vessels.
	112	Regulatory authority develop performance standards for fast rescue craft launch/recovery.
Joint Government and Industry Regulations, Standards, Procedures	25	Drilling units have onboard crews for all lifeboats and one extra lifeboat crew.
	44	Primary responsibility of standby vessel is to maintain station within prescribed parameters.

Topic	Recomm. Number	Remarks
	49	Persons on rig and standby vessel to formally record when standby conditions are not met.
	54	Canada develop contingency plans for a major marine disaster and train government and industry personnel in the plan.
	96	Regulatory authority, in conjunction with industry, to identify MODU "safety critical systems".
	107	Government and industry establish standards for, and develop, MODU safe primary evacuation systems.
Evacuation Arrangements, Equipment & Technologies	23	Drilling units be equipped with lifeboats for 200% of the crew.
	24	Liferafts on drilling units required to be davit-launched units.
	43	Conduct an immediate assessment of the capability and suitability of existing offshore standby vessels offshore East Coast Canada.
	62	Public Address and Emergency Alarm systems be independent of each other and operable for 6 hours.
	108	Standards for davit-launched liferafts be reviewed in terms of stability, construction, and boarding at sea.
	109	Standards for all types of abandonment suits to be amended to include rescue-enhancing technologies.
	114	Industry-chartered helicopters be equipped and available for rescue services in a secondary role.
Industry Personnel Issues & Training Actions	26	Lifeboat crews to be at least four persons, each suitably trained and certificated in lifeboat operations.
	27	Lifeboat crews to be trained in the use and operation of their own equipment, including launches at sea.
	28	Lifeboat crews required to launch and operate the lifeboat at sea at least twice each year.
	42	Industry to hold periodic exercises for the purpose of training its key personnel in emergency actions.

Topic	Recomm. Number	Remarks
	46	Establish training standards for the crews of vessels performing standby, and such training be mandatory.
	47	Training noted in Rec. 46 to include prescribed topics in equipment use, rescue activities, survivor treatment.
	48	Crews of standby vessels be exercised in the use of the rescue equipment at least weekly, weather permitting.
	113	Crew of a standby vessel be thoroughly trained as a team through courses and frequent sea exercises.
Industry Procedures	29	Industry to establish appropriate practices and incentives to recognize the importance of the lifeboat crews and provide resources for their preparation and training.

This summary enabled the project team to focus their data gathering efforts on areas where there would most likely be corroborative information to establish the recommendation's current status of implementation.

3.2 Data Categorization

Individual research activities may not be able to be referenced against specific RCOMD recommendations. The data records provided in APPENDIX E are cross-referenced by:

- The type of work effort that was addressed:
  - Technology
  - Statute or Regulation
  - National or Industry Standard (of performance)
  - Industry Policy, Procedure or Practice
  - Personnel / Training Impacts
  - Communication of Work (Releases, Journals, Magazines, etc)
- Whether the work was conducted by Government or Industry
- The RCOMD recommendation to which the work corresponds

The Data Record identifies the specific work undertaken, the date when it was conducted (as closely as can be determined), a short précis of the outcomes, the categorization elements noted above, and the contact information of the principal party engaged in the work (or the present custodian of the data).

3.3 Data Observations

While this report is confined to the identification and reporting of advances in search and rescue methods, technologies and procedures resulting specifically from the RCOMD recommendations, it should be recognized that there is a significant level of parallel activity – much of it supported directly or indirectly by federal government resources – that is also promoting the safety of life at sea.

Numerous examples of these activities were encountered during the data-gathering phase of this project, but are not included herein because the activity rose from a perceived need within a unique community of interest, rather than in specific response to the RCOMD recommendations. Frequently the goals are identical and the potential synergies can be realized, through a linkage of the communities of interest, could represent mutual benefits.

It is interesting to note that the research activities follow a clearly defined cyclical pattern, as presented in Table 2 and graphically in Figure 1. This is clearly demonstrated even in this relatively small sampling of EER research. The individual sample numbers do not represent all EER research, but are considered as being representative of trending. Information items included within the Bibliography accentuate this distribution.

Table 2 – Research / Communication Activity Sampling By Year

YEAR	NUMBER OF ACTIVITIES	SIGNIFICANCE
1982	2	*Ocean Ranger* lost and initial investigations commenced.
1983	6	RCOMD studies and activities.
1984	12	RCOMD Report One released in August-- Report 2 work ongoing.
1985	13	RCOMD Report Two released in June – Canada "takes stock".
1986	13	With the RCOMD Reports released, Industry and Government in Canada take action. European research activity levels rising.
1987	10	Continuing activity in EER technological advances.
1988	7	Loss of *Piper Alpha* in North Sea (U.K.).
1989	4	Completion of existing projects – New projects placed on hold.
1990	2	*Piper Alpha* (Cullen) Report released in November.
1991	5	Risk-Based systems investigated; Enhancements in Training; freefall technology appearing; Hibernia research support.
1992	2	East Coast Offshore Project EER support; more activity is being conducted with in-house resources.
1993	3	Research ongoing, but work on management systems and Cullen implementation has more activity.
1994	0	Much less work being done on EER systems, more on emergency management studies; human factors awareness is rising.
1995	7	EER work now being conducted as part of management of offshore emergencies rather than as technology.

YEAR	NUMBER OF ACTIVITIES	SIGNIFICANCE
1996	0	More emphasis on accident causation and prevention and less on the specific technologies of survival.
1997	6	Interest in EER technologies rebounding in Canada as management systems research slows.
1998	11	Modeling of EER process is gaining attention; time/motion studies and Human Factors become issues for "Escape" phase.
1999	3	Many "summary" papers being produced; Some model testing done; apparent efforts to stimulate government and industry interest; workshops discussing future research directions conducted; late year establishment of Atlantic Canada Petroleum Institute (ACPI) provides coordinated access to industry research funding.
2000	2	With offshore management systems now in place, some interest in technology and enhancing the safety of the current EER technologies in respect of equipment performance standards and impacts on Human Factors.
2001	8	Interest in Arctic EER has been low level, but steady; More activity now focused on ice/water EER interface; some work on setting equipment "performance and reliability" standards being done; on East Coast, offshore project EER research on Floating Production / Storage / Offloading (FPSO) installations is being conducted; late 2001 government announces $20 million research fund.
2002	10	More research into "extreme conditions" survivability (heavy weather, heavy ice); in Canada, impact of availability of government and industry funding supporting offshore research institutions is felt; Industry PRAC research funding model replaces ACPI; late year Atlantic Energy Round Table discussions stimulate industrial and research opportunities interest.
2003	9	East Coast proof-of-concept modeling regularly reported, with particular regard to TEMPSC performance; EER technology research commonly conducted.
2004	5	Canadian and international interest re-kindled in TEMPSC survivability and testing performance capability in heavy weather.
2005	5	While the full research data set is not yet available for 2005, more interest arose in the "elements" of EER technologies, such as TEMPSC launch release equipment.

In identifying the nature of the EER research focus, the distribution of the effort across the range of the conducted research was noted – in particular the activities conducted within each of the information categories of this project.

The technology/equipment aspects of EER research attracted a significant level of effort, with 76 activities, representing 56% of the data sample. The aspects of EER research associated with regulation, standard and guideline development and implementation totaled 44 activities and represented some 33% of the research efforts sampled. Research into human behaviour, training and communications accounted for 15 research activities, and represented 11% of the data sample. This breakdown is presented in Figure 2.

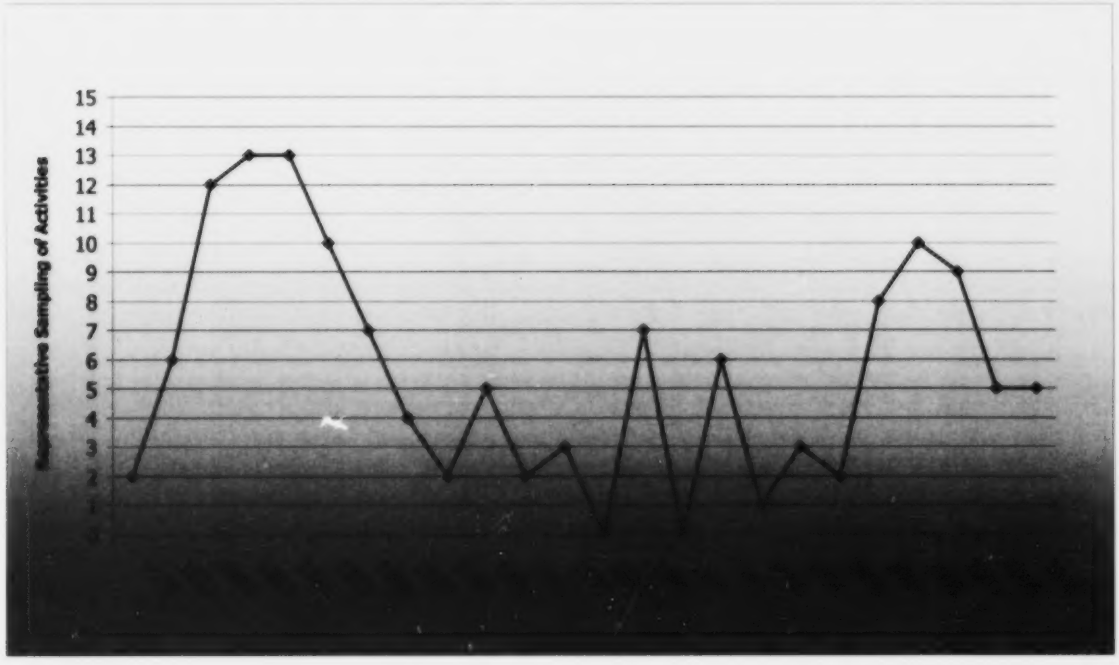

Figure 1 – Graph of Research / Communication Activity Sampling By Year

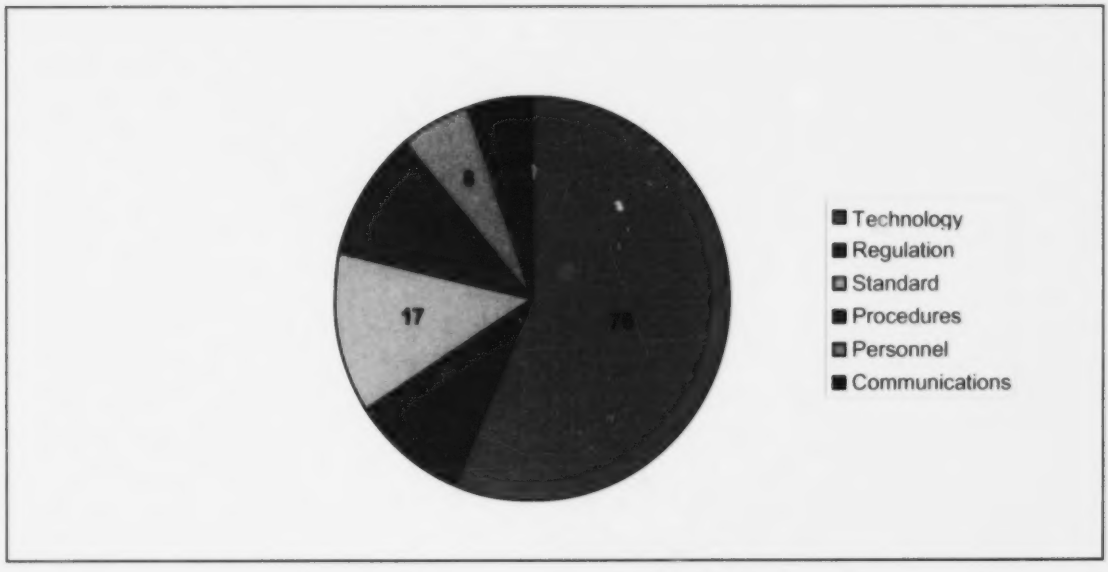

Figure 2 – Distribution of Activity by Research Category

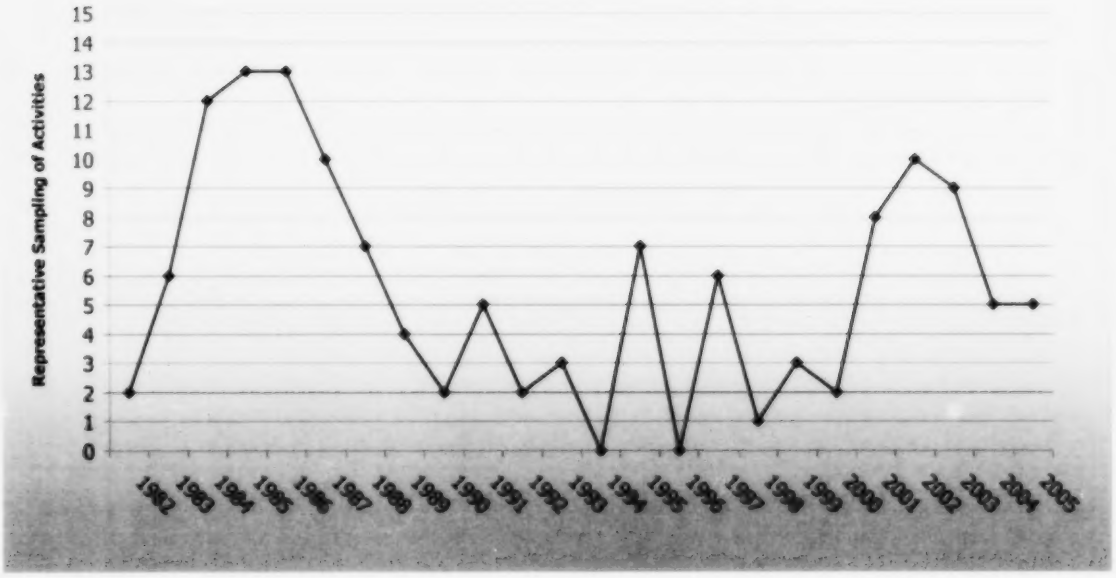

Figure 1 – Graph of Research / Communication Activity Sampling By Year

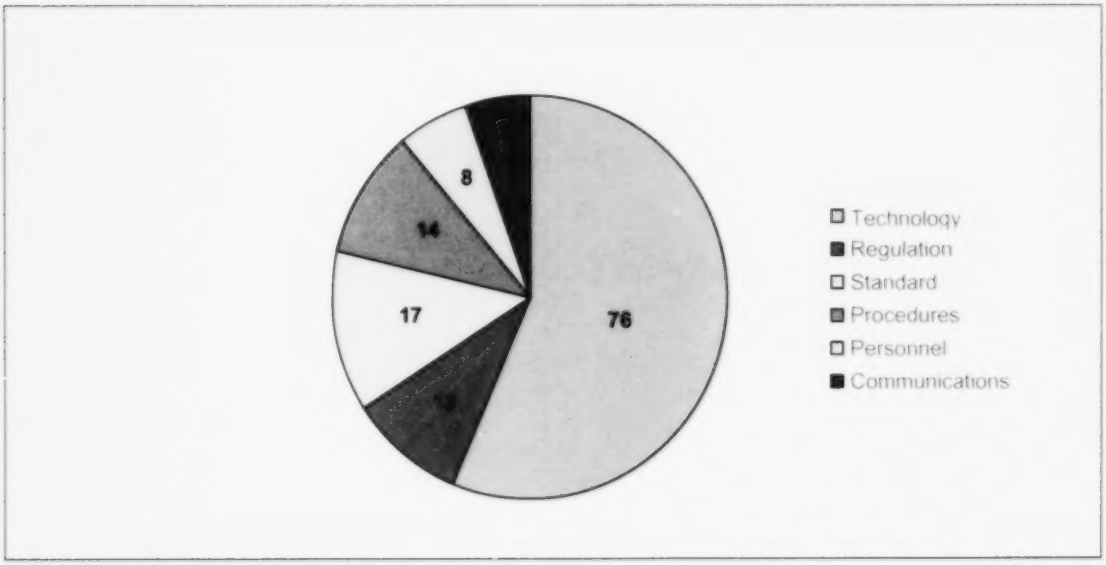

Figure 2 – Distribution of Activity by Research Category

4. ANALYSIS OF THE RESEARCH RESULTS

The discussion sections were developed from the review and analysis of the foregoing data and are presented in the categories of research improvement noted below.

4.1 Data Discussion

Focusing upon the 31 recommendations from RCOMD Report One and Report Two, it became apparent to the project researchers that the initial impetus for response activity focused upon the years shortly after the Royal Commission's reports were published. Not surprisingly, the sampling data indicates that the majority of the research and development work was conducted between 1983 and 1988, in some cases solely by government departments and agencies and, in others, in conjunction with industry stakeholders. The government Panel on Energy Research and Development (PERD), with energy industry input, was the principal vehicle for the support of post *Ocean Ranger* EER technology research.

This was also the period of public consultations on the government's regulatory response. With the public and special interest groups insisting on regulatory improvements to assist in eliminating (or reducing) the potential for a similar occurrence in the future, regulators found themselves engaged in urgent regulatory amendment activities. Political demands drove much of the regulatory change in the aftermath of the loss of the *Ocean Ranger* and crew, since the federal parliament and provincial legislatures do not always provide a timely response to a technical justification for regulatory amendment.

Each of the Transport Canada regulations pertaining to the safety of offshore energy units and installations was amended during this period (i.e. Life Saving Equipment Regulations, Crewing Regulations, Marine Certification Regulations, etc.). Existing performance standards were examined and amended (i.e. Standards for Lifeboats, Marine Emergency Duties) and new performance standards issued (i.e. Standards Respecting Standby Vessels, and Standards Respecting Mobile Offshore Drilling Units).

Similarly, within the realm of the energy regulators, the Canada Oil and Gas Lands Administration (COGLA) promulgated in conjunction with Labour Canada, the Oil & Gas Occupational Safety and Health Regulations.

Regulations and standards, which encompassed the best available combination of technical capability of the equipment, commercial feasibility and regulatory assurances against disaster were put into place in the years immediately after the release of the RCOMD reports. Subsequently, interest in regulatory amendment waned. There was an inability to keep pace with the technological advancements resulting from the increased rate of research and development, and many of the good ideas of the 1980s were left unimplemented.

In the 1990s the trend of EER research was slower. Activities were still being undertaken, but at reduced level of effort. It is probable that, in recognition of the loss of the *Piper Alpha* installation in the UK North Sea, other areas of research were competing for the same resources.

There was an apparent resurgence of R&D activity in the late 1990s and early 2000s. This coincided with the formation of energy industry research organizations. These organizations supported research and development for two new offshore production operations in Newfoundland and preparatory work for one additional production project in Nova Scotia (that was not realized).

A number of the RCOMD recommendations did not lend themselves to a "simple fix" by single government departments or individual industry organizations. Consultations among government and industry stakeholders were conducted to determine what might have been specifically intended by the wording of the recommendations. Further discussions focused upon determining measurement criteria that would establish to the satisfaction of all parties whether the action taken was adequate and sufficiently complete to provide closure to the recommendation.

Certain of the recommendations required the agreement and close cooperation not only of departments that deal with federal and provincial energy policy and the administration of the exploration and exploitation of the offshore natural resources, but of other government departments and agencies.

Other recommendations required new statutes, or at least the amendment of existing statutes, having a wide range of impacts on the offshore industry. Such regulatory amendments are not taken lightly and are thoroughly evaluated by government and selected industry stakeholders to gauge the effect that their promulgation will cause.

Industry and government created technological change along a number of parallel fronts through enhancements to the EER process, practices and equipment.

4.2 General Research Discussion

4.2.1 EER general research conducted since the loss of the *Ocean Ranger* and crew has contributed significantly to the implementation and maintenance of those RCOMD recommendations that pertain to EER improvements.

4.2.2 There is a strong correlation between the willingness (and/or necessity) of organizations to support research and the ability of research institutions to conduct meaningful work.

Where direct support has been made available, it has manifested itself in two primary ways:

- "in kind" support through the provision of tangible logistical or physical assistance, equipment or personnel;
- direct funding made available through individual organizations (including government) or representative associations or societies.

The provision of direct funding appears to stimulate more innovative research, whereas 'in kind' support has been used more for confirmatory research or investigating "variations on a theme".

4.2.3 The existence of the regulatory tithe on offshore acreage holdings and levels of activity has provided a vehicle through which funding of offshore-associated research across a wide range of interests has been continued, even in the face of low levels of offshore activity.

4.2.4 Over the past 15 years, there has been an increase in the Canadian offshore industry's use of regional research centers to fund investigations into areas of specific interest to those companies. This has benefited the companies by utilizing a local research facility where they can more closely monitor the progress of their projects of interest, and it has also benefited local research facilities by allowing them to invest in the development of their facilities and personnel.

4.2.5 While there are still examples of individual offshore companies conducting their own focused research or investigation into projects of interest, the East Coast offshore industry has taken steps to coordinate its research needs and goals through industry-supported research associations.

The Atlantic Canada Petroleum Institute (ACPI) was an initial step in bringing together the resources available through the offshore industry, the federal and provincial governments and the regional research community. ACPI has been replaced by Petroleum Research Atlantic Canada (PRAC), which has broadened the access amongst those principal parties.

PRAC's most recent efforts at promoting effective communication amongst the various interest groups, and clarifying industry research needs and interests to the performers, has been through initiating the development of research "Communities of Interest" (COI). These COI will focus on specific areas where groups of expertise can be brought to bear on research that is meaningful to the offshore industry and the offshore regulators.

4.2.6 There appears to be a more successful sharing of research results by the partnerships in the North Sea than currently demonstrated within the Canadian offshore industry.

Either the direct reports, or many of the references to existing research, are registered in the data banks of North Sea industry organizations or the regulators. Two such information repositories are the UK Health and Safety Executive (HSE) and the Petroleum Safety Authority (PSA) of Norway.

There have been a few identified instances where the Canadian offshore industry and the research community have established projects and priorities that have already been previously investigated and viable conclusions drawn.

Some of these projects have been conducted without any knowledge that identical research activities had been previously conducted. Granted, some of this work has been maintained within corporate entities, but the institutional (or industry) memory of those earlier activities has faded.

The existence of PRAC, and perhaps the availability of information from the Canada Institute for Scientific and Technical Information (CISTI), should alleviate this duplication of effort as organizations would be approached to provide evidence of their research efforts to one of those bodies.

4.2.7 There have been shifts in the focus of offshore research, usually in response to some significant event. Immediately after the loss of the *Ocean Ranger* and her crew, the Canadian research focus followed the lines of improving the survival equation: *Technology + Training = Survival*.

Substantial research was conducted on the physical capabilities and reliability of marine escape devices. Novel escape and evacuation technologies were presented almost monthly. Regulatory requirements to provide effective EER technologies steered research organizations towards improvement of life saving equipment. This drive to design and develop better survival technology was carried out on both sides of the Atlantic.

With the loss of the *Piper Alpha* installation and 167 offshore personnel in July 1988, and with the publication of the Public Inquiry into the *Piper Alpha* Disaster ("Cullen Report") in October 1990, offshore research shifted its focus from technology to systems. For the *Piper Alpha*, the issue was not the sea state or the survivability of the marine evacuation technologies, it was the failure of the safety management system, and the command and control structure, to prevent – or then successfully manage – the emergency event. The survival equation changed: *Management Systems + Training + Technology = Survival*.

A significant number of safety management system and (quantitative) risk analysis studies were initiated. This shift of industry and regulator interest did not stop evacuation technology development, but it slowed it down as the resources that had been directed to evacuation technologies were shared with studies into management systems and the prevention of offshore emergencies.

In noting the foregoing, it would be untrue to presume that incident prevention had not already been high on the regulator and industry "under way" list. The advances in materials and equipment performance standards (discussed elsewhere in this report) demonstrate that industrial improvement pertaining to the prevention of emergencies was maintaining a steady pace.

4.3 EER Technology Discussion

4.3.1 The analytical and applied research conducted on Escape, Evacuation and Rescue technologies has been successful in enhancing the safety of the offshore workplace and contributed to the implementation and maintenance of the RCOMD recommendations pertaining to EER.

4.3.2 Parallel advances have been made in:

- the survivability of the individual (immersion suits),
- the means of evacuation (launching system enhancements),
- the seaworthiness and survivability of the evacuation vehicle (lifeboat / liferaft),
- the reliability and effectiveness of the search and rescue/recovery systems (designated standby vessels equipped with multiple recovery options including personnel rescue baskets and fast rescue craft, and increased capability SAR aircraft).

4.3.3 In EER-related research, considering the continued occupancy of any available Temporary Safe Refuge as untenable, there are considered to be five primary methods of evacuating an offshore facility. In descending order of desirability and likelihood of a successful outcome, these are:

(1) transfer by helicopter through planned precautionary down-manning or emergency evacuation if the aircraft is available,

(2) direct transfer to an attendant standby or rescue vessel,

(3) marine evacuation via Totally Enclosed Motor Propelled Survival Craft (TEMPSC),

(4) marine evacuation via davit-launched liferafts,

(5) personal evacuation in an immersion suit from the facility to the sea via abseiling devices, ladders, or jumping from the facility directly into the sea.

A considerable amount of research has been conducted on Items 3 to 5. However, recently there has apparently been substantially less research undertaken on Items 1 and 2.

Considering that these two methods of evacuation hold the most likely promise of success (in environmental conditions where the technologies can perform to their established limits), it appears that many researchers either consider the problem already solved, or are planning for the worst eventuality – in-extremis conditions.

4.3.4 The adoption and implementation of enhanced EER system *performance standards* has not been as successful as incrementally improving the technology.

Global market forces have hampered the advances in performance standards, particularly with regard to the TEMPSC, where manufacturers of technologies must, to stay competitive, design and build EER equipment for a broader end-user market.

In the overall maritime world, the offshore energy industry represents a relatively small percentage of assets when compared to the shipping fleets of the world.

This means that while focused research may identify the advantages of particular performance gains through the implementation of technological improvements (i.e. TEMPSC hull design, engine specifications, propeller design), in the face of limited market potential represented by the offshore energy industry, few manufacturers are currently equipped to apply a performance based approach in the design of life saving equipment.

Regardless of whether the industry is willing to pay for safety improvements, some major TEMPSC manufacturers have indicated that they will not consider interrupting their current production line to design/develop new equipment for potential customers. When faced with this type of commercial resistance, it is difficult for the offshore energy industry (regionally and globally) to establish enhanced performance standards for EER technologies.

4.3.5 With respect to Recommendation 109, industry is currently working with its government partners to define the benefits of further improvements to the Helicopter Immersion Suit Transportation System. Substantial discussion has been undertaken regarding the provision of an independent supply of breathable air being available to the passenger should the aircraft invert upon water contact. Regrettably, this advance in capability is being hampered by the paucity of research material available on this important topic. Most of this research has been conducted within the medical community or within individual commercial organizations and is not readily available. The lack of information has unnecessarily delayed the industry and regulators from arriving at an informed decision whether to implement the change and, if implemented, how it should be managed.

4.4 EER Regulation Discussion

4.4.1 The establishment and enforcement of updated regulations, particularly in the years immediately following the loss of the *Ocean Ranger* and crew, represented a major advancement in Canadian offshore safety. Certainly the offshore energy industry had initiated its own internal improvements, but a number of the new regulatory requirements established prescriptive targets going beyond the improvements that the industry initially adopted.

4.4.2 The pace of certain areas of regulatory change has not kept up with the pace of technological and procedural change within the offshore energy industry.

Coupled with the ongoing advancement of performance standards in both Canada and around the globe, elements of the "original" prescriptive regulations put in place immediately after the loss of the *Ocean Ranger* and crew are now outdated and do not reflect current "standard industry practice" and certainly not industry "best practices" within the EER field.

Compliance with these outdated regulatory requirements has hampered innovative research into certain areas of technological improvements in EER systems. This is demonstrated in cases where many successful research efforts are simply adjusted applications of existing EER systems in which a performance gain is still measured against compliance with current requirements, such as a more reliable lifeboat release mechanism, or launching/releasing a TEMPSC at a greater distance from the installation.

4.4.3 Current regulation has no *formal* method of allowing industry (or the regulator, for that matter) to offer or accept alternative solutions that provide an equivalent level of safety to the prescriptive requirements of outdated legislation. Informal methods of acceptance, with reasonable checks and balances, have been put into place to ensure that equivalent-to-existing EER standards are met.

4.4.4 Certain elements of regional East Coast and National EER regulation put into place in the middle 1980s still provide a safer offshore workplace than may be found in many other offshore jurisdictions. Increasing pressure from the global energy industry to "harmonize" acceptability of the lowest common denominator in favour of market desires has become more persistent, as many of the other regulatory requirements do not reflect current capabilities.

Where it is the intent (and current accomplishment) of the Canadian offshore energy industry to maintain a safe offshore workplace in the local operating environments, eventual rationalization of requirements to the level of "what is regulated" inevitably occurs.

4.4.5 Much discussion has been engendered around the inflexibility of existing prescriptive regulation to keep pace with industrial advances in technology and processes/procedures. Proponents of "performance-based" regulation are vocal with regard to the benefits of adopting this approach.

It has been interesting to note that many groups have differing definitions as to the context and content of "performance-based regulation". The output ranges from "adopt any method you wish to reach this (prescriptive) goal", to "let me decide the goal that I can achieve with current capabilities – and then we shall analyze if it is adequate".

Certainly performance-based regulation will be substantially more challenging for the regulatory agencies and departments to administer. Prescriptive regulations tend to be "black and white" and decisions on compliance are based on defined observations that can be applied across a wide array of behaviours and organizations. Performance-based regulation appears as shades of grey, with a cloudy definition of "what is good enough?" that must take into account the "external factors" of an organization's related supporting efforts.

There is concern within government circles that the same performance-based regulation (or requirement) may not be able to be applied equitably to all industry proponents.

On the other hand, performance-based regulation, that places the responsibility of achieving a desired level of capability with industry, does allow the industry proponent to put into place activities and technologies that will meet that established "goal", without being restricted to approaches and technologies noted within regulation. Some sources have indicated that establishing a "goal" is prescriptive in itself. However, without the goal being established, how can the regulator establish if a desired behaviour is credibly reached?

4.4.6 It should be noted that a significant effort has been made by joint government/industry working groups to develop regulations regarding the knowledge and training of personnel in identified critical positions on board drilling and production, fixed and floating, offshore installations.

4.4.7 Critical task personnel are required to comply with regulations regarding competence in both marine and industrial matters and, within the marine component of the offshore installation crew, are required to re-validate that competence every five years. Personal survival training re-validation is presently required in Canada at three-year intervals, although ongoing discussion is focused upon extending that validity period to four years, in order to attain equivalence with other international offshore jurisdictions.

4.5 Standards Discussion

4.5.1 Advances have been made in producing performance standards for EER systems, and in the development of critical technologies for other aspects of offshore activity. Many of these are not directly attributable to the RCOMD recommendations, but they have enhanced the safety of the offshore workplace.

4.5.2 The joint efforts of the Federal and Provincial governments and their industry partners resulted in the development of a number of EER equipment and operational standards. These were established in the middle and late 1980s, and stem directly from the RCOMD recommendations.

4.5.3 Industry and government are stakeholders in the continuing development of personal survival equipment standards. In particular, the Canadian standards for the Marine Abandonment Immersion Suit and the Helicopter Transportation Immersion Suit System were co-developed by industry experts.

4.5.4 In many aspects of offshore activity, Canada has established domestic standards of EER performance and implemented them on all petroleum installations, foreign and domestic, working in the Canadian offshore jurisdiction. The requirements of certain of these standards that influenced the provision of EER capabilities no longer reflect the higher level common practices of industry performance in the offshore environment. They were reflective of modern requirements at the time of promulgation, but in some cases have since lost their relevance.

4.5.5 In more recent versions of some Canadian standards, the adoption of non-Canadian performance requirements has been implemented through "incorporation by reference". This is a positive step towards harmonization, while assuring that a level of performance acceptable in the Canadian operating environment is still mandated. There is still regulatory resistance in adopting "not made in Canada" standards for selected areas of offshore activity.

4.5.6 Industry, working with the offshore regulators, has developed standards pertaining to a number of aspects of offshore activity. Many of these deal with personnel issues, such as standards for the development of highly specialized training courses and materials, as well as training and qualifications guideline requirements for industry offshore personnel.

4.5.7 The regional Offshore Petroleum Boards have developed safety and operational assessment and acceptance standards for offshore installations entering their jurisdictions. While currently each jurisdiction usually issues its own Certificate of Fitness for Offshore Installation, joint talks have been underway for some time to resolve the final issues to support the establishment of an East Coast Installation Certificate of Fitness.

4.6 Industry Procedures Discussion

4.6.1 There has been a major shift in industry thinking regarding the development, implementation and maintenance of EER procedures since the loss of the *Ocean Ranger* and crew.

Emergency Response Plans have become more sophisticated in their ability to deal with escalating situations, through incorporating the principles of Incident Command. Most onboard installation Emergency Response procedures have changed to become "multi-threat" instead of "mono-threat".

4.6.2 Communication procedures (and technology) today bear scant resemblance to the Single-Side-Band and "phone-patch" radio technologies available during the early 1980s. Directed communications, more reliable technologies, alternative communications options and "loss of contact" procedures all enhance the offshore management team ability to identify, respond, control, and take steps to mitigate the harm from offshore emergencies.

4.6.3 Industry has put into place procedures for the rapid mustering and accounting of all personnel onboard an installation. This permits the offshore management team to initiate early search and rescue operations with site resources.

4.6.4 Industry has put into place "Joint/Multi-Operator Resource Sharing Agreements" that are designed to provide field support among offshore projects in emergencies. Liability and commercial issues have been agreed in advance to streamline the provision of inter-operator emergency response assets.

4.6.5 Industry received Federal and Nova Scotia government permission to establish an emergency response and helicopter refuelling facility on Sable Island that provides a close-range safe haven refuge for evacuees from installations operating on the Scotian Shelf. Industry has developed procedures for accessing and using the facility, which has been provided with shelter, food, water and basic comforts for the evacuees while rescue and recovery operations are ongoing.

4.6.6 Government departments and industry have developed procedures for effective communications during the conduct of offshore distress situations.

4.6.7 General industry occupational health and safety policies, programs, procedures and practices have been established to focus workplace efforts on the prevention of emergency situations. A considerable amount of work has gone into the development of "safety management systems" as a framework for safe operations and for the control of emergencies should they arise. Interest from the regional petroleum boards has arisen in this context and operational guidelines have been put into place requiring the offshore energy industry to strongly consider the implementation of a safety management system for individual offshore activities, as well as for the longer-term resource development projects.

4.7 Personnel / Training Discussion

4.7.1 Industry, working closely with the regional Offshore Petroleum Boards, has developed the East Coast Offshore Training and Qualifications Guideline (in successive editions) to establish a standard level of competency and safety training for offshore personnel.

The TQG sets the training requirements and competencies for personnel working on board drilling and production installations, as well as for attendant standby and supply vessels, and further established the course content and standards for industry-required training for all offshore personnel.

4.7.2 While accommodating the requirements of Transport Canada in the certification of persons in charge of a survival craft, the offshore industry has developed standards for its own Survival Craft Coxswain training program that focuses on the technologies and procedures used in the East Coast offshore areas.

4.7.3 As a result of the work of the EPOA/APOA Offshore Safety Task Force, and later responding to the RCOMD recommendation regarding the training of the offshore workforce, industry developed a standard for a regionally specific fit-for-purpose Personal Survival Training Program. This Basic Offshore Training program has evolved into the inter-provincially accepted standard for Basic Survival Training (and refresher) program that is required for personnel working offshore today. Industry has provided, and continues to provide, financial and technical support to ensure that this standard of training maintains its high quality of safety education as technology and procedures change.

4.7.4 While application of the regionally specific training standard has provided the short-term benefit of dealing with local issues, the continuing formal reliance upon "this and no other" standard has provided challenges for both industry and the regulator. Negotiations have overcome the original intra-jurisdictional differences in training standards and today the offshore energy industry enjoys the reasonable portability of personnel between provincial jurisdictions.

The same cannot be said for international reciprocity of personal survival training. The RCOMD recommendations do not refer to international reciprocity, but only to the requirement that the East Coast offshore workforce be effectively trained in understanding their responsibilities and suitably prepared to carry them out. This has been demonstrated in-extremis with units that have been involved with the East Coast offshore, where reliance upon the competent exercise of the learned skills have saved peoples' lives at sea.

4.7.5 Industry has developed internal procedures and training programs for the assessment and acceptance of the Offshore Installation Manager and critical members of the offshore emergency command team.

4.7.6 The Department of National Defence / Coast Guard Joint Rescue Coordination Centre (JRCC) has developed familiarization and training sessions specifically for onshore and offshore industry emergency response teams. These sessions have improved the JRCC understanding of the offshore energy industry and substantially enhanced the communications interface for both parties.

4.7.7 Although not envisioned by the RCOMD recommendations, industry is currently recognizing the factors regarding "the aging workforce". Where Human Factors research is being conducted in EER areas, this approach may necessarily have to be broadened to address retainment of the offshore workforce, eventually dealing with the generational replacement of the human resource.

Of critical importance to this challenge will be the adjustment of the training processes to next-generation learners, particularly in the EER context, where simulation training in other fields is being suggested as a model for future learning processes. Consideration of research in this currently non-core area of offshore EER may be appropriate now or in the near future.

The foregoing discussions are supported in part by the materials noted in APPENDIX E, which contains a selection of technical detail data records that provide a sampling of the more representative research initiatives carried out during the period under review.

4.8 Incomplete Compliance with Recommendations

APPENDIX A presents the original text of the RCOMD recommendations, which focused on EER issues, as well as an assessment of current compliance with the letter of the recommendation. Currently government and industry are not in full compliance with the recommendations as worded by RCOMD; however, this non-compliance does not constitute a hazard to the safety of the offshore workforce.

The data does indicate that in the areas where compliance with the specific wording of the recommendation is not followed, alternative approaches have been implemented such that there is no reduction in the safety protection of the offshore workforce or offshore operations. These areas of partial compliance include:

- The number of lifeboat crews assigned to emergency duties is one for each lifeboat. There are no designated "spare" crews (Recommendation 25). However, since all regular crew change personnel complete personal survival training prior to travelling offshore, each person has a basic knowledge of lifeboat controls and their function. Also, each lifeboat crew is comprised of two persons, not four as put forward by the RCOMD (Recommendation 26).
- An area of ongoing industry concern is the RCOMD recommendation (and requirement in regulation) to launch all lifeboats at least once per year, including at-sea installations (Recommendation 28). Industry organizations and the lifeboat crews view this intended practice as hazardous when at sea and the lifeboats are generally not launched to sea and manoeuvered in the offshore environment. The owners and crew of the offshore installations have put into place alternative methods of verifying readiness to launch. Lifeboat crews launch lifeboats at onshore training facilities every three years, when they recertify their "Survival Craft Leader" training.

- Industry has not adopted the concept of special recognition and incentives for the lifeboat crews (Recommendation 29), but has allocated the required resources to ensure that the Survival Craft Coxswains and crew maintain proficiency in accordance with the applicable training standards.
- The recommendation to upgrade the military Search and Rescue (SAR) helicopters was originally undertaken for in-service enhancements (SARCUP), but it has been only recently that new SAR aircraft have been procured.
- An omnibus act specific to mobile offshore drilling units and offshore installations was not specifically enacted (Recommendation 80). However, the promulgation of the *Canada Oil and Gas Operations Act* and the establishment of regional offshore petroleum boards serve a similar function with regard to the safety of offshore activities, and particularly with respect to EER.
- Industry helicopters operating over the Grand Banks have "active-mode" rescue equipment available and substantial crew training was conducted. While the equipment was available in Nova Scotia, the proximity to a military air station with rescue support meant that the same level of implementation as in Newfoundland and Labrador was not required.

As an additional factor in considering the Nova Scotia rescue preparedness situation, the Scotian Shelf operating area includes the relatively safe haven of Sable Island. In place of an active mode industry rescue service, industry with government approval, has established a helicopter landing pad with fueling facility on the island, as well as a temporary refuge within one of the buildings, and has provided survival rations, water, sleeping bags and other minor comforts. The proximity of this safe haven to the majority of the operating areas has reduced substantially the reliance on an industry active-mode rescue capability.

4.9 Offshore General Safety System Improvements

Limiting the discussion to only the areas of advancement to the EER domain and associated technology does not accurately portray the broad field of enhancements to offshore operational safety and health established by government and industry organizations.

The RCOMD reports were not limited to the EER process and technology, but also made recommendations in many areas of potential improvements to offshore safety, some of which have been discussed previously. Other areas included:

- Structural issues (assessments and improvements)
- Stability improvements
- Drilling unit design
- General operating procedures
- Collection and analysis of incidents involving injury, pollution or loss
- Ballast Control system improvements (equipment placement, personnel training)
- Environmental impacts (data collection, effect on structures)
- Regulatory development
- Mooring systems

Well Planning

Within the selection and planning of exploration drilling programs, there has been great advancement in the understanding of soil formations and the considerations under which the safe pursuit of petroleum extraction can be accomplished. Sophisticated technologies and processes for assessing geological structures and the identification of which structures may lead to formation overpressures or downhole temperature issues have been instrumental in advancing the safe planning of well programs and the development of drilling technologies to increase safety of personnel and protection of the environment.

Drilling Equipment

Drilling technologies have also increased in sophistication. Control of the drill string pipe joints on the drilling deck (or Rig Floor) has advanced from cat-winches and chains used to "spin" drill pipe connections, to hydraulic/mechanical systems on the Rig Floor conducting the heavy movements (Iron Roughneck), to moving the rotary system from the Rig Floor to the upper reaches of the drilling derrick ("Top Drive") and to ultramodern horizontal pipe racking and pipe handling systems requiring minimal human intervention. All of these improvements have increased the safety of the personnel and of the operation.

Technology advances in well control equipment and better emergency response procedures have provided for major improvement in drilling unit safety. Blow Out Prevention planning, equipment and execution are built upon the better awareness of the well planning process.

There are many more improvements to drilling equipment and processes, including better downhole monitoring tools and better training for drilling team personnel to understand the condition of the well as indicated by the instrumentation. Control of the drilling process has been made safer and more efficient through computer monitored/controlled sensors and equipment allowing the Tool Pusher, Driller or Assistant Driller to expand their focus to include more opportunities for safety observations, rather than only monitoring gauges and other indicators.

Drilling Unit Structure and Design

Initial structural improvements implemented immediately after the loss of the Ocean Ranger and crew involved the Ballast control systems. The primary Ballast Control station was to be re-positioned to an area not able to be flooded, or suitably strengthened so as to resist flooding. A secondary Ballast Control station was installed in an area above contact with the sea.

Assessments of the structural arrangement of floating and bottom-founded drilling units were undertaken, with particular attention to the design and structural capability to withstand severe environmental forces. All deck or compartment openings where water could enter the structure were analyzed with respect to the angle of downflooding and certain openings closed where they did not meet the revised expectations.

The American Petroleum Institute published recommended practices for planning, designing and constructing fixed and mobile offshore installations that further improved the structural capacity of the units.

As noted within the EER focus of this report, the number of lifeboats on each drilling unit was increased to provide for 200% seating for all of the drilling unit complement.

Although fire was not an issue during the loss of the Ocean Ranger and crew, the new structural assessments also gave rise to the installation of more effective fire barriers, better detection technologies, and more effective and efficient means of fire suppression.

Structural improvements did not cease in Canada with the implementation of the RCOMD recommendations. As briefly noted above, the Canadian government published the *Standards Respecting Mobile Offshore Drilling Units* (TP 6472) which included a number of structural improvements, many based upon the Mobile Offshore Drilling Unit Code as published by the International Maritime Organization (IMO).

Research into structural improvements continues today, and Canada participates in a leading role in the safety of Arctic structures under the auspices of the International Standards Organization (ISO). The ISO is currently addressing performance requirements of polar offshore installations through its Working Group 8 – Arctic Structures. Work by various Technical Panels (TPs) has been ongoing for over three years under the following categories:

TP1 Environmental TP4 Artificial Islands
TP2 Action/ Loading/ Reliability TP5 Steel
TP2a Reliability TP6 Concrete
TP2b Ice TP7 Floating
TP2c MetOcean TP8a Facilities – Topsides
TP2d Seismic TP8b Facilities – EER
TP3 Foundations TP9 Ice Engineering

All standards under development by these TPs are to be Performance Based Standards (PBS), all generally following an agreed format for presenting the standard. Whereas the work of these TPs is currently retained "in committee", specific details of their progress cannot be published until formally promulgated (draft anticipated by end 2006, with promulgation by late 2007, or early 2008).

As the Canadian PBS development program had preceded the ISO TP8b work, many of the detailed provisions from the Canadian PBS (noted within this report's References) were adopted with some modifications. However, the overall philosophy of the ISO EER PBS approach is to provide qualitative rather than quantitative performance targets through a focus on the use of probabilistic and risk analytic procedures in the optimization of EER systems installed. TP2a the Reliability Panel however, is mandated to develop quantitative safety targets for not only each category of offshore petroleum installation to guard against catastrophic and serviceability failures, but also for the associated installation EER systems and procedures.

TC 67/SC 6 *Offshore Platform Systems* is an international group working to improve the safety of offshore structures by improvements in the standardization of the materials, equipment and offshore structures used in the drilling, production, transport by pipelines and processing of liquid and gaseous hydrocarbons within the petroleum, petrochemical and natural gas industries. SC 6 works with Processing Equipment and Systems.

Ballast Control Systems

A significant contributor to the loss of the Ocean Ranger and crew was the performance of the Ballast Control system, with respect of its design, its complexity, its built-in safeguards against non-standard operating conditions, and the training of the crew in recognizing, diagnosing and appropriately responding to system malfunctions.

As previously noted above, in Drilling Unit Structure, as a result of the findings of the RCOMD major changes were implemented to the positioning of the Ballast control stations and to the fittings within the Ballast Control systems of mobile offshore drilling units working offshore East Coast of Canada. Further improvements were implemented, such as providing the ability to establish the draft of the drilling unit from within the Ballast Control Room, a critical element of stability control. The ballast system valves for all units were modified to fail "close" or "in place" when control of the system was lost. The pontoons were equipped with ballast pumps at both the forward and aft extreme ends of the pontoons such that de-watering could be conducted at greater angles of list or trim. System design complexity was reduced as much as reasonably practicable. Training of personnel in the onboard Ballast Control system was re-focused. Ballast Control Operators and other responsible members of the unit command team were trained in the workings of the Ballast control system.

Mooring Systems

The reliability of drilling unit mooring systems was investigated and improvements in winch systems, highly accurate positioning systems, chain reliability and anchor design have been progressing over the past 24 years. Although not directly related to the loss of the Ocean Ranger and crew, advances in mooring system understanding and technology have improved the safety of the drilling unit structures by increasing their reliability and resistance to severe environmental conditions, which may otherwise result in a marine abandonment of the drilling unit.

Procedural Improvements

While emergency procedures are discussed in the forgoing sections of this report, the development of many other policies, programs, procedures and practices have provided a larger margin of safety for the offshore workforce. The improvements made through the development of regulatory requirements. Further developments of the safety science as a whole, have expanded the reliability of the "operating system" approach for offshore work. Marine Operations Manuals, Drilling Operations Manuals, Drilling Practices and Procedures, Emergency Response Plans, Safety and Health Management Systems, all documents critical to the safe execution of an offshore activity, have benefited from regulator and industry learning since the loss of the *Ocean Ranger* and crew.

Practical operations procedures such as Medical Evacuation procedures, Ice Management plans, Vessel Tracking and Flight Following plans, common emergency radio frequencies among offshore operations, multi-operator resource-sharing agreements all have been developed by industry, reviewed by regulatory authorities, and now form part of the daily operating environment of the offshore industry.

Regular reporting of the number and types of offshore occurrences of injury and other losses, where such reporting is formatted in terms of similar reporting definitions, has given the regulators and industry tools to trend the improvement (or decline) of the effectiveness of offshore safety programs.

Modernized approaches to the understanding of quantitative and qualitative risks to which the offshore workforce is exposed has given rise to the implementation of Risk Assessment and Risk Analysis as means to reduce offshore hazards. This has stimulated a greater attention exercised by the workforce of identifying potential hazards in their workplaces, collecting information through Task/Job Observation programs, and evaluating the potential harm through Job Safety Analysis, Hazard Assessments and Risk Ranking systems. This activity alone has improved the margin of safety for the offshore workforce for even routine tasks.

Personnel Factors

Where the RCOMD recommendations focused on the performance of personnel emergency response and EER, health and safety improvements must also include a process for improvement of personnel management. This report has previously discussed advances in offshore emergency response training as they pertained to the RCOMD recommendations. Other personnel training advances include skills verification and the application (in conjunction with Transport Canada) of an education and competency-based certification regime for the senior marine-oriented personnel working onboard offshore drilling (and production) units.

Offshore workforce health factors have seen significant improvement with the implementation of the *Canadian Association of Petroleum Producer's East Coast Offshore Health Advisory Committee's Guide*: *East Coast Medical Assessment for Fitness to Work Offshore*. As contra-indicated medical conditions can be identified and examined, and a safe treatment regimen suitable to the offshore working environment can be put into place, offshore worker health has greatly improved. This is of particular significance in the face of the well-recognized issue of an aging workforce.

Summary of General Safety Improvements

It is not the purpose of this report to catalogue all of the safety system improvements implemented in the offshore working environment since the loss of the Ocean Ranger and crew. This sampling of those general safety and health advances that have provided larger returns on the investment of resources should support the understanding of the work that has been conducted, and is still ongoing, by both the regulator and industry. These efforts have taken the advance of offshore health and safety farther afield than just those focus areas of the RCOMD recommendations. The work of improving offshore safety and health is never complete and continues today.

5. CONCLUSIONS

The conclusions that are developed from the review and analysis of the foregoing data are presented in the categories of research improvement noted above.

5.1 General Research

5.1.1 The coordination of industry research requirements through organizations such as PRAC, with its recent concept of Research Communities of Interest, provides the benefit of focused research assistance to the industry as well as benefits of funding access to the research community for practical research and the ability to enhance personnel and facilities.

5.1.2 Records of EER research are not shared as widely as is needed, particularly where "in-house" research activities are concerned. Working within the cyclical nature of the East Coast offshore energy industry, institutional memory of some of the previous research gains has been lost, causing inefficiencies and some duplication of research activity, potentially wasting research resources.

5.2 EER Research (Technology and Other)

5.2.1 Private and public funded research in EER technology has been steady, but has resulted primarily in incremental improvement.

5.2.2 EER research follows a "pattern of disaster", establishing elements of technological capability found lacking in the last event. There is relatively little work breaking "new" ground.

5.2.3 Areas of research in the EER context that hold the promise of most likely success (helicopter evacuation or direct transfer to safe haven) appear to be investigated less, by virtue of the paucity of literature available, than those offering lower success, but potentially easier solutions.

5.3 Safety Regulation

5.3.1 It has, unfortunately, been demonstrated that regulatory development, much like the EER technology research, generally keeps pace with the last major disaster.

Prescriptive regulatory requirements put into place to respond to specific needs are generally appropriate at the time, but are rapidly overtaken by technological progress. There is no evidence that prescriptive regulatory change has been able to keep up with modern technology or processes within the offshore EER paradigm.

5.3.2 There has been much discussion regarding "performance-based" regulation. Proponents of that type of regulation have stated that the advances of technology and procedural approach can be better adapted and adopted to create a safer offshore workplace. Certainly, it has been demonstrated that there exist circumstances where compliance with prescriptive requirements has reduced the timely implementation of new (but not yet approved) approaches.

5.4 EER Standards

5.4.1 There have been definitive advances and improvements in equipment and system standards since the loss of the *Ocean Ranger* and crew.

5.4.2 The model of joint government/industry development of standards is generally working.

5.4.3 The "incorporation by reference" of non-Canadian nationally and internationally recognized standards is improving. Currently, the anecdotal evidence on the adoption of foreign standards implies that 'if Canadian participation is not part of the development of a foreign standard then it cannot be accepted'. This has been partially supported in fact and has contributed to the delay in modernizing certain offshore technology standards.

5.5 EER Procedures

5.5.1 Industry has substantially improved its understanding of the requirements for effective emergency response since the loss of the *Ocean Ranger* and crew. Industry and government have implemented many procedures regarding incident command, control, and communications that have improved the margin of safety for the offshore workforce.

5.6 Industry Personnel / Training

5.6.1 Changes in approaches to dealing with offshore emergencies and the training of the current generation of the offshore workforce have been particularly successful. The joint government / industry training standards model does have some challenges yet to overcome, particularly in terms of international training standards reciprocity, but the overall results of the training system have been demonstrably proven to be a significant improvement to the training provided in 1982.

5.6.2 Industry current training approaches have been called into question regarding the changes in understanding of adult learning theory. There is a currently low-level concern that current training approaches do not reflect the needs of the modern learner, potentially making EER (and other) training less effective.

6. RECOMMENDATIONS

6.1 General Research

6.1.1 The current joint industry / government / research community arrangements for planning and funding of EER research opportunities should continue to be supported by government and industry joint membership and funding support.

6.1.2 A more coordinated method of compiling offshore-related EER research into a readily accessible format and location needs to be developed. This research (or application of existing technology) should be document management oriented.

6.2 EER Research (Technology and Other)

6.2.1 Consideration should be given to establishing discrete areas of program interest, such as:

- Development of a more survivable Temporary Safe Refuge on board installations that would reduce the reliance upon marine evacuation in unfavourable sea states,
- TEMPSC technologies (launch systems, vehicle releases, performance standards in higher sea states / ice conditions, hull, propulsion, recovery technologies for both safe return to unit after drills and safe recovery at sea in appropriate sea states),
- Aviation technologies that would make the pre-positioning of standby or rescue aircraft in or near the offshore field less of an operational challenge,
- Arctic escape technologies (reliably bridging the ice/water interface),
- Human factors engineering (human decision-error potentials in emergencies, debilitating effects of sea motion, capacity allocation within the lifecraft, comfort-type securing of personnel within the lifecraft).

6.3 Safety Regulation

6.3.1 It has, unfortunately, been demonstrated that regulatory development generally keeps pace with the last major disaster. It is recommended that government work more closely and effectively with the offshore energy industry to establish those areas where amendments to the current prescriptive regulatory approach may be put into place.

6.3.2 "Performance-based" safety management system regulation should be considered, particularly in those areas where suitable advances in EER approaches and technology may provide the impetus for innovation that is currently restricted by compliance with outdated prescriptive requirements.

6.4 EER Standards

6.4.1 Government should review methods to more effectively and expeditiously evaluate non-Canadian standards put forward by industry for regulatory acceptance in the Canadian offshore regime. Such standards could involve structural requirements, equipment capabilities, or the adoption of enhanced procedures or best practices.

6.5 EER Procedures

No recommendations to procedures are being suggested to advance beyond the RCOMD recommendations.

6.6 Industry Personnel / Training

6.6.1 In order to maintain the currently effective implementation of the RCOMD recommendations on crew emergency preparedness, when dealing with issues of retaining and recruiting the offshore workforce, industry will have to consider adjusting its approaches to adult learning, particularly with regard to the applicability and effectiveness of current EER training. Concepts of simulation training and other techniques have been suggested that may benefit from non-core EER research activities.

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APPENDIX A

Table A-1 RCOMD Recommendations Regarding Escape, Evacuation & Rescue

Recomm. Number	Original Text	Actioned
Report 1		
20	That the appropriate regulatory authority conduct or cause to be conducted an analysis of the critical systems and their interrelationships on all drilling units in order to determine the adequacy of their response to emergency conditions. That there be subsequent periodic analyses as may be warranted.	Yes
22	That Canadian authorities consider the development of an evacuation system that will provide an adequate and safe means of escape in forseeable emergency storm conditions to be a matter of the utmost priority and that they encourage through every means at their disposal the earliest development and use of a safe system.	Yes
23	That drilling units be equipped with sufficient lifeboats for 200% of the crew.	Yes
24	That liferafts required to be on drilling units be davit-launched.	Yes
25	That drilling units be required at all times to have sufficient lifeboat crews to man lifeboats for 100% of the crew plus one additional lifeboat crew.	Partial
26	That a lifeboat crew consist of four persons each holding a *Certificate of Efficiency* as a lifeboatman under the *Certification of Lifeboatmen Regulations* and that in addition to these requirements each prospective member of a lifeboat crew be required to establish to the satisfaction of the examiner that he is skilled and knowledgeable in:	Partial (Crew: 2)
	a) passenger control and crew organization in emergencies involving evacuation of the unit;	Yes
	b) survival procedures and techniques;	Yes
	c) search and rescue procedures and organization;	Yes
	d) the sea-keeping characteristics of the lifeboats;	Yes
	e) the operation of the lifeboat radio.	Yes
27	That lifeboat crews be required to be trained in the use and operation of the type of lifeboat to which they are assigned and that this training include actual launching and operation of the lifeboat in the sea.	Yes

Recomm. Number	Original Text	Actioned
28	That lifeboat crews be required to launch and operate the lifeboat in the sea at least twice each year. If this cannot be conveniently or safely done from the drilling unit then it should be done from a shore-based installation.	Partial
29	That industry establish appropriate practices and incentives which recognize the importance of the lifeboat crews and which ensure adequate time and resources for their preparation and training.	No
30	That drilling contractors be required by regulation to identify to inspectors during their periodic inspections of MODUs those crew members who are certificated lifeboatmen.	Yes
42	That periodic exercises be held by industry for the purpose of training its key personnel in what would be required of them in the event of an emergency.	Yes
43	That there be an immediate assessment by the appropriate authority of the capability and suitability of the various types of vessels now serving as standby craft to drilling units off Eastern Canada to perform adequately their rescue role.	Yes
44	That the primary responsibility of a vessel acting in the capacity of a standby vessel for a drilling unit be to standby within the prescribed time of distance from the unit and be ready at all times to render whatever assistance to the rig and its crew that may be required.	Yes
45	That no vessel be permitted to act as a standby vessel if its cargo would interfere with its ability to render assistance to the rig and its crew.	Yes
46	That there be established training standards for the crew of any vessel which is to be used as a standby vessel and that training embodying these standards be required.	Yes
47	That the training embodying these standards, *inter alia*, instruction in: a) the use and operation of all rescue and emergency aids with which the standby vessel is equipped; b) the treatment of survivors for the injuries and other conditions from which they may be suffering upon rescue; c) the deployment of the standby vessel and its equipment to render effective assistance to the drilling unit and its crew in various emergencies that may occur.	Yes Yes Yes Yes
48	That the crews of standby vessels, while on standby duty, be exercised in the use of the vessels' rescue equipment at least weekly, weather permitting.	Yes

Recomm. Number	Original Text	Actioned
49	That the person in command of the rig and the master of the standby vessel be required to log any occasion when the standby vessel exceeds the prescribed time or distance. That where the standby vessel exceeds the prescribed time or distance without the consent of the person in command of the rig, both the person in command of the rig and the master of the standby vessel be required to submit written reports to the regulatory authority.	Yes
50	That the Rescue Coordination Centre in Halifax and the Search and Rescue Emergency Centre in St. John's have available, for instant retrieval, all relevant information with respect to offshore drilling operations on the continental shelf within their respective zones of responsibility that might be required in the event of a marine casualty. That this information include relevant data not only with respect to the drilling units but also with respect to the contracted helicopters and supply vessels.	Yes
53	That as a matter of urgent priority Canada complete its SARCUP program to upgrade existing SAR helicopters and obtain others capable of longer ranges and with endurance for rescue missions offshore.	Partial
54	That Canada develop a contingency plan outlining the procedures to be followed in the event of a major marine disaster and that joint exercises be periodically held to train key personnel of SAREC, RCC, industry both on shore and on the rigs and standby vessels in what they would be required to do in the event of rig evacuation under emergency conditions.	Yes
62	That public address and emergency alarm systems each be independent of the other and that each be operable for up to six hours in the event of a loss of electrical generation capability.	Yes
Report 2		
80	That there be enacted an omnibus act specific to MODUs, and to the varied aspects of their drilling operations, including the standby role of vessels and the rescue role of helicopters under contract to the industry.	Partial
96	That the regulatory authority, in consultation with industry, identify for each drilling rig offshore those systems which are critical for its safety and the safety of its crew.	Yes
107	That a) government and industry without delay establish performance standards and initiate a joint major engineering development project to produce a safe primary evacuation system for offshore drilling rigs.	Yes

Recomm. Number	Original Text	Actioned
	b) during the intervening period, it be a condition of the right to drill that existing primary evacuation systems be improved or replaced so as to improve materially their capability to evacuate the crew.	Yes
108	That the standards for davit-launched life rafts be reviewed in order to determine their adequacy with respect to stability, method of construction and joining, and means of entry into them from the sea.	Yes
109	That there be included, *inter alia*, in the standards for all types of abandonment suits, requirements for a greater number of sizes, improved neck seals, the use of radar-reflecting materials, strobe lights and personal locator beacons, the protection of the user's face from breaking waves, grips or other means to facilitate recovery, some form of head protection and the flotation of the wearer in an upright position.	Yes
111	That the regulatory authority publish performance standards which determine the characteristics, equipment and supplies required for a vessel to qualify as a suitable standby vessel.	Yes
112	That a) the regulatory authority develop performance standards which determine the characteristics of a suitable launching/recovery system for fast rescue craft. b) fast rescue craft be required to have engines which can be started and warmed up out of the water.	 Yes Yes
113	That a) the crew of a standby vessel be thoroughly trained as a rescue team, both through courses and through documented, frequent and regular exercises at sea and that each member of the crew receive, in addition, specialized training for assigned emergency duties. b) the number of crew members be sufficient to perform the varied duties required for rescue and treatment of survivors in the event of a disaster.	 Yes Yes
114	That helicopters under contract to the industry be equipped and available for rescue services in a secondary role; the crews be specially trained for that purpose and hoist operators and rescue technicians be readily available.	Partial (NL only)

APPENDIX B

Table B-1 Matrix of RCOMD Recommendations and Identified References

	Royal Commission Recommendation Number																														
Ref. #	20	22	23	24	25	26	27	28	29	30	42	43	44	45	46	47	48	49	50	53	54	62	80	96	107	108	109	111	112	113	114
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APPENDIX C

Table C-1 RCOMD Recommendations and Corresponding Reference Activities

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Report 1	
20	13, 14, 23, 56
22	20, 22, 23, 24, 26, 28, 30, 31, 33, 37, 47, 48, 49, 52, 56, 59, 60, 61, 64, 76, 79, 87, 97, 101, 105, 111, 113, 114, 115, 116, 117, 124, 129, 130, 131
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24	23, 33, 56, 59, 64, 67
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47	14, 18, 21, 23, 40, 46, 54, 56, 62, 63, 67, 90, 93, 103, 107, 108
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80	23, 29, 41, 67, 80, 81, 82, 83, 84, 85, 110
96	23, 29, 67, 77, 80, 81, 82, 83, 84, 85, 86
107	19, 22, 23, 24, 26, 28, 29, 30, 31, 33, 37, 43, 44, 45, 47, 48, 49, 52, 53, 55, 58, 59, 60, 61, 64, 68, 71, 73, 75, 76, 79, 87, 88, 89, 94, 97, 98, 99, 100, 101, 102, 105, 106, 109, 111, 114, 115, 117, 118, 119, 120, 121, 123, 125, 126, 127, 128, 130, 131, 132, 134
108	18, 23, 29, 33, 59, 67

Recomm. Number	Applicable Reference Sheet Number(s)
109	18, 23, 29, 36, 42, 57, 64, 65, 67, 74, 95, 96, 104, 122, 135
111	23, 29, 67
112	23, 29, 40, 50, 51, 64
113	18, 23, 29, 40, 46, 64, 67, 91, 92, 93, 107, 108
114	15, 23, 29, 32, 33, 34, 35, 37, 66

The RCOMD recommendations that have trended the most activity out of the sample set are (in descending order):

107 Government and Industry establish performance standards for evacuation systems and initiate a joint engineering effort to produce a safe primary evacuation system. Until that goal is reached, existing systems are to be materially improved (61 activities).

22 Canadian authorities are to consider the development of an evacuation system that will provide a safe means of escape in foreseeable emergency storm conditions to be a matter of utmost priority (35 activities).

47 There be established specific training requirements and topics for the crew of any standby vessel (16 activities).

109 There be included within the standards of all types of abandonment suits requirements for sizing, improved neck seals, use of radar-reflecting materials and other improvements (15 activities).

113 The crew of the standby/ rescue vessels to be adequately trained and there be assigned an adequate number of crew on each vessel to conduct the rescue and treatment of survivors (13 activities)

43 Activities in support of an immediate assessment of the capabilities of offshore standby/ rescue vessels (11 activities).

46 There be established training standards for the crew of any standby vessel and that the training provided embodies those standards (11 activities).

80 There be enacted an omnibus act specific to MODUs and to the varied aspects of their drilling operations, including the role of the standby vessels and the rescue role of helicopters (11 activities).

96 The regulatory authority, in consultation with industry, identify for each drilling rig offshore those systems which are critical for safety (11 activities).

APPENDIX D

Table D-1 Project Data References Associated with RCOMD Recommendations

Project Reference	RCOMD Recommendation(s)
001	Pre-Report 1 – Regulation applied to offshore prior to Report 1
002	Pre-Report 1 – Industry activity underway
003	Pre-Report 1 – Industry activity underway
004	Pre-Report 1 – US NTSB Findings on loss of *Ocean Ranger* and crew
005	Pre-Report 1 – Industry activity underway
006	Pre-Report 2 – Industry activity underway (Helicopter improvements)
007	Pre-Report 2 – Government activity underway
008	Pre-Report 1 – Regulation applied to offshore prior to Report 1
009	Pre-Report 2 – Industry activity underway (Helicopter improvements)
010	Pre-Report 1 – Industry activity underway
011	RCOMD Report 1 (66 Recommendations)
012	43, 45
013	20, 43
014	20, 46, 47, 49
015	114
016	43
017	53, 54
018	27, 42, 43, 46, 47 [Pre-Report 2 Activity: 108, 109, 113]
019	[Pre-Report 2 Activity: 107]
020	22
021	47
022	22 [Pre-Report 2 Activity: 107]
023	20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 42, 43, 44, 45, 46, 47, 48, 49, 50, 53, 54, 62 [Pre-Report 2 Activity: 80, 96, 107, 108, 109, 111, 112, 113, 114]
024	22 [Pre-Report 2 Activity: 107]

Project Reference	RCOMD Recommendation(s)
025	RCOMD Report 2 (70 Recommendations)
026	22, 107
027	43
028	22, 107
029	80, 96, 107, 108, 109, 111, 112, 113, 114
030	22, 107
031	22, 107
032	114
033	22, 24, 44, 107, 108, 114
034	114
035	114
036	109
037	22, 107, 114
038	54
039	43
040	44, 46, 47, 112, 113
041	80
042	109
043	107
044	107
045	107
046	44, 45, 46, 47, 48, 49, 113
047	22, 107
048	22, 107
049	22, 107
050	43, 112
051	43, 112
052	22, 107
053	107
054	47
055	107
056	20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 42, 43, 44, 45, 46, 47, 48, 49, 50, 53, 54, 62
057	109

Project Reference	RCOMD Recommendation(s)
058	107
059	22, 24, 107, 108
060	22, 107
061	22, 107
062	47
063	47
064	22, 23, 24, 27, 43, 44, 107, 109, 112, 113
065	109
066	114
067	23, 24, 27, 42, 46, 47, 80, 96, 108, 109, 111, 113
068	107
069	Helicopter Egress – Not an RCOMD recommendation
070	Helicopter Egress – Not an RCOMD recommendation
071	107
072	27, 46
073	107
074	109
075	107
076	22, 107
077	44, 96
078	Human Factors– Not an RCOMD recommendation
079	22, 107
080	80, 96
081	80, 96
082	80, 96
083	80, 96
084	80, 96
085	80, 96
086	96
087	22, 107
088	107
089	107

Project Reference	RCOMD Recommendation(s)
090	47
091	26, 27, 113
092	26, 113
093	47, 113
094	107
095	109
096	109
097	22, 107
098	107
099	107
100	107
101	22, 107
102	107
103	46, 47, 48
104	109
105	22, 107
106	107
107	27, 42, 46, 47, 113
108	27, 42, 46, 47, 113
109	107
110	50, 80
111	22, 107
112	Human Factors– Not an RCOMD recommendation
113	22
114	22, 107
115	22, 107
116	22
117	22, 107
118	107
119	107
120	107
121	107

Project Reference	RCOMD Recommendation(s)
122	109
123	107
124	22
125	107
126	107
127	107
128	107
129	22
130	22, 107
131	22, 107
132	107
133	International Liaison – Not an RCOMD recommendation
134	107
135	109

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APPENDIX E

Project Reference Sheets (Chronological Order of Response Activities 1982–2005)

No Graphic Available

Record Number: 001

Research Category: REGULATION

Improvement Reference: Establish requirements for Emergency Training and Drills onboard vessels

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: Pre-Report

Effective Date: September 1982

Title: Boat and Fire Drill and Means of Exit Regulations

Author: Transport Canada

Description:

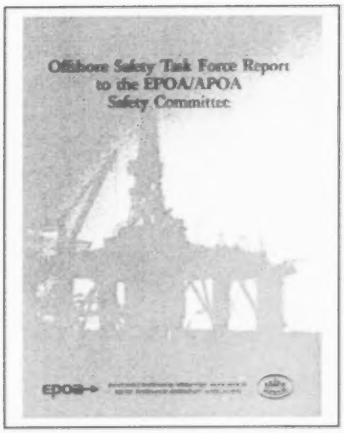
Originally published as the *Boat & Fire Drill Regulations* in 1982, the Regulations established requirements for the regular and proper conduct of Fire Drill and Abandon Ship exercises to be conducted on Canadian ships.

The Boat and Fire Drill Regulations were repealed in 2005 and re-promulgated as the *Boat and Fire Drill and Means of Exit Regulations*.

Regulations promulgated under the authority of the Regional Petroleum Boards and joint Industry-Government training guidelines now establish emergency drill and exercise requirements for offshore installations and support ships.

Contact Information:

Transport Canada
Tower C, Place de Ville,
330 Sparks Street
Ottawa, Ontario, Canada, K1A 0N5
Tel: (613) 990-2309
URL: http://www.tc.gc.ca/marine



Record Number: 002

Research Category: PROCEDURES

Improvement Reference: Evaluate the Status of East Coast Offshore Safety

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: Pre-Report

Effective Date: December 1982

Title: EPOA/APOA Offshore Safety Task Force

Journal: Eastern Offshore News, Vol. 4, No. 3, December 1982 (pp.5)

Description:

The Offshore Safety Task Force was established to review and evaluate the existing offshore safety practices of the petroleum industry and prepare a report within a short term and specific time frame.

The Task Force is addressing existing industry marine safety practices and programs, procedures and contingency plans, present and proposed government safety regulations, existing and state-of-the-art safety and lifesaving equipment, standby rescue vessel and helicopter emergency support capabilities.

Contact Information:

Canadian Association of Petroleum Producers
Suite 2100, 350 7th Avenue S.W.
Calgary, Alberta, Canada T2P 3N9
Tel: (403) 267-1100
Fax: (403) 261-4622
E-Mail: communication@capp.ca
URL: http://www.capp.ca

Record Number: 003

Research Category: TECHNOLOGY

Improvement Reference: Study Conducted of Offshore Survival Technologies

Area of Impact: International

Organization Category: Government

Royal Commission Recommendation: Pre-Report

Effective Date: August 1983

Title: Evacuation of Personnel by Sea – Steering Committee for Emergency Preparedness – SSB 2.2 Proceedings and Summary

Author: Det norske Veritas

Description:

Offshore installation evacuation systems on installations in the Norwegian North Sea were studied and evaluated for potential improvements. The work conducted under SSB 2.2 was instrumental in developing the freefall lifeboat concept that was installed on the Gullfaks Platform, as a model for future installations.

This early research also contributed to the international understanding (and eventual implementation in Canada) regarding the duties and capabilities of dedicated and designated standby and rescue support vessels.

While the majority of this work was conducted prior to the loss of the *Ocean Ranger* and crew, its value to follow-on research cannot be overlooked.

Contact Information:

Det norske Veritas
Veritasveien 1
1322 Høvik, Norway
Tel: (+47) 67 57 99 00
Fax: (+47) 67 57 99 11
E-Mail: DNV.Corporate@dnv.com
URL: http://www.dnv.com

No Graphic Available

Record Number: 004

Research Category: TECHNOLOGY

Improvement Reference: Not Applicable

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: Pre-Report

Effective Date: February 1983

Title: Capsizing and Sinking of the U.S. Mobile Offshore Drilling Unit Ocean Ranger Off the East Coast of Canada

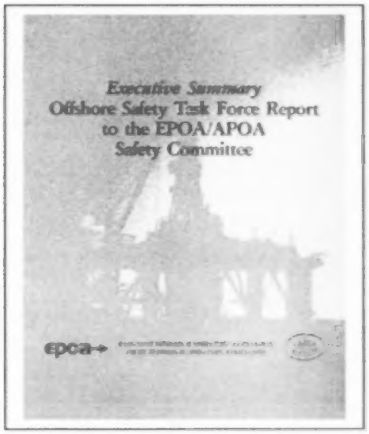
Author: United States National Transportation Safety Board
Report NTSB–MAR–83–2

Description:

The National Transportation Safety Board published this report into the loss of the *Ocean Ranger* and crew. The NTSB determined that the probable cause of the capsizing and sinking of the Ocean Ranger was the flooding of the anchor chain lockers in the forward columns when it took on a 10 degree to 15 degree list in the direction of the severe wind and wave action.

Contact Information:

National Transportation Safety Board
Records Management Division
490 L'Enfant Plaza, SW
Washington, DC USA 20594
Tel: (800) 877-6799
(202) 314-6551
URL: http://www.ntsb.gov



Record Number: 005

Research Category: PROCEDURES

Improvement Reference: Evaluate the Status of East Coast Offshore Safety

Area of Impact: International

Organization Category: Industry

Royal Commission Recommendation: Pre-Report

Effective Date: October 1983

Title: Executive Summary – Offshore Safety Task Force Report to the EPOA/APOA Safety Committee

Author: East Coast Petroleum Operators' Association

Description:

Report identifies and establishes offshore energy industry priorities for marine safety concerns related to the offshore in six areas:

- Regulation
- Life Saving and Rescue Equipment
- Marine Emergency Training
- Offshore Safety Programs
- Emergency Response Plans
- Standby / Rescue Ship and Helicopter Operations

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Calgary, Alberta, Canada T2P 3N9
Tel: (403) 267-1100
Fax: (403) 261-4622
E-Mail: communication@capp.ca
URL: http://www.capp.ca

No Graphic Available

Record Number: 006

Research Category: TECHNOLOGY

Improvement Reference: Summary of ongoing activities in the enhancement of offshore safety technologies

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: Pre-Report

Effective Date: December 1983

Title: Operational Safety Enhancement Activities

Journal: Eastern Offshore News, Vol. 5, No. 3, December 1983 (pp 8-10)

Description:

Summary of helicopter-deployable rescue technology in testing and in place on the East Coast. The equipment reviewed includes: EMPRA (Emergency Multiple-Person Rescue Apparatus); Standoff Emergency Assistance (SEA) Kits; and marine abandonment immersion suits.

Procedural enhancements were also reviewed, including vessel and helicopter tracking, standby vessel duty guidelines, and petroleum operator emergency response plans.

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No Graphic Available

Record Number: 007

Research Category: STANDARD

Improvement Reference: Amended Regulations or Guidelines

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: Pre-Report

Effective Date: December 1983

Title: COGLA Issues Revised Safety Guidelines and NLPD Updates Drilling Requirements

Journal: Eastern Offshore News, Vol. 5, No. 3, December 1983

Description:

Comprehensive reviews with the governments have assisted in the development of the revised safety guidelines for 1984 announced by COGLA.

The Government of Newfoundland and Labrador issued its requirements and procedures on December 16, 1983. The terms and conditions for winter drilling were updated.

Contact Information:

Canada-Newfoundland and Labrador Offshore Petroleum Board
5th Floor TD Place, 140 Water Street,
St. John's, NL, Canada A1C 6H6
Tel: (709) 778-1400
E-mail: Postmaster@cnlopb.nl.ca
URL: http://www.cnlopb.nl.ca

No Graphic Available

Record Number: 008

Research Category: REGULATION

Improvement Reference: Regulations for the carriage of Life Saving Equipment (lifeboats, liferafts, life rings, immersion suits, etc.) on Canadian ships

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: Pre-Report

Effective Date: November 1983

Title: Life Saving Equipment Regulations

Author: Transport Canada

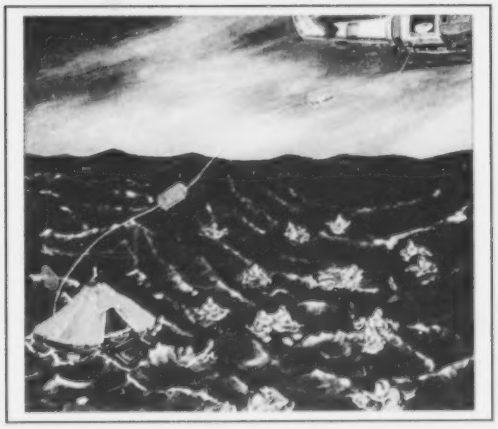
Description:

The Life Saving Equipment Regulations (LSER) were originally promulgated in 1978. As a result of the loss of the *Ocean Ranger* and crew, they were amended in November 1983 (SOR/83-500), establishing the mandatory carriage of immersion suits on Canadian vessels.

The LSER have been amended numerous times, with the latest revision (at the time of writing) as of November 2004.

Contact Information:

Transport Canada
Tower C, Place de Ville,
330 Sparks Street
Ottawa, Ontario, Canada, K1A 0N5
Tel: (613) 990-2309
URL: http://www.tc.gc.ca/marine



Record Number: 009

Research Category: TECHNOLOGY

Improvement Reference: Helicopter-deployed survival technology to assist personnel in the sea

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: Pre-Report

Effective Date: January 1984

Title: Stand-Off Emergency Assistance Kit (S.E.A. Kit) MK1

Author: Narwhal Marine

Description:

The Narwhal Standoff Emergency Assistance (SEA) Kit is a non-military version of a helicopter-deployable water survival system. Composed of five elements (2 inflatable liferafts, 2 survival equipment pods, and a container), the SEA Kit can be deployed from a slow-moving helicopter upwind of a group of in-water survivors.

The liferafts are the extreme ends of a measured tether line, with the 2 floating equipment pods strung between them. Moving with surface currents and surface winds, the assembly takes on a horseshoe configuration as it drifts over to the survivors. Survivors grasp the connecting lines between the packages and pull themselves to a liferaft. When all personnel are boarded, the equipment pods can be retrieved, one on each raft, and the personnel can await recovery in the relative shelter of the liferaft.

Contact Information:

W.A.T.E.R. Associates
702 Old Sackville Road
Lower Sackville, NS Canada B4C 2K3
E-Mail: LBell@water-research.com

No Graphic Available

Record Number: 010

Research Category: TECHNOLOGY

Improvement Reference: Survey of international standby vessels and their capabilities

Area of Impact: International

Organization Category: Government

Royal Commission Recommendation: Pre-Report

Effective Date: May 1984

Title: Oilfield Standby/Rescue Vessels and the East Coast of Canada

Author: Captain M. Williamson, Craigmore Offshore Ltd.

Description:

Report identifies the current fitted equipment and capabilities of Canadian and international standby / rescue vessels. It discusses technologies and processes used during rescues and provides a catalogue of existing ship capabilities with regard to rescue and recovery equipment carried aboard.

Contact Information:

Canada-Newfoundland and Labrador Offshore Petroleum Board
5th Floor TD Place, 140 Water Street,
St. John's, NL, Canada A1C 6H6
Tel: (709) 778-1400
E-mail: Postmaster@cnlopb.nl.ca
URL: http://www.cnlopb.nl.ca

Record Number: 011

Research Category: TECHNOLOGY

Improvement Reference: Royal Commission on the *Ocean Ranger* Marine Disaster
Report One

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: N / A

Effective Date: August 1984

Title: Report One: The Loss of the Semisubmersible Drill Rig *Ocean Ranger* and its Crew

Author: Royal Commission on the *Ocean Ranger* Marine Disaster (Hickman Commission)

Description:

This Report presents the findings, conclusions and recommendations of the Royal Commission on the *Ocean Ranger* Marine Disaster, as they relate to the sinking of the vessel and the loss of all 84 souls on board.

The Report published 66 recommendations, many of which are the focus of this research report.

Contact Information:

Canada-Newfoundland and Labrador Offshore Petroleum Board
5th Floor TD Place, 140 Water Street,
St. John's, NL, Canada A1C 6H6
Tel: (709) 778-1400
E-mail: Postmaster@cnlopb.nl.ca
URL: http://www.cnlopb.nl.ca

No Graphic Available

Record Number: 012

Research Category: TECHNOLOGY

Improvement Reference: Assessment of Industry Search and Rescue Vessels

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 43 & 45

Effective Date: April 1984

Title: Assessment of Industry's Ability to Respond to an Offshore Emergency on the Grand Banks (Contains "Notes on Potential Gaps")

Author: G. R. Yungblut, EPI Resources Ltd.

Description:

In January 1984, the Operators on the Grand Banks asked EPI Resources to prepare a scope of work to be used in assessing and evaluating a number of vessels that had been proposed to be stationed on the Grand Banks to serve as a special rescue/emergency response/offshore helibase facility. During the course of discussions between the operating companies and the responsible government regulatory agencies, it became clear that there was a lack of agreement on what are the gaps in the present system.

EPI was asked to review the recent studies on the capability and limitations of various pieces of rescue/survival equipment, to identify the life threatening situations that can occur offshore and to match these against the frequency at which limiting environmental conditions occur on the Grand Banks. The report is a summary of the information obtained and conclusions drawn as a result of that review.

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Calgary, Alberta, Canada T2P 3N9
Tel: (403) 267-1100
Fax: (403) 261-4622
E-Mail: communication@capp.ca
URL: http://www.capp.ca

No Graphic Available

Record Number: 013

Research Category: PERSONNEL

Improvement Reference: Senior Officer Marine Emergency Management Training

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 20 & 43

Effective Date: October 1984

Title: Senior Officer Training Marine Emergency Management Forum (Report)

Author: Craigmore Offshore Ltd. For the East Coast Petroleum Operators Training Committee

Description:

This reference is a summary evaluation of the series of pilot training programs.

The objectives of this training program were to present the senior marine officers, senior supervisors of drilling crews and selected government officials with interface materials to promote understanding and education regarding joint offshore operations, both in normal operating mode and in times of emergency.

Shortly after the publication of this report, the Senior Officer Marine Emergency Management training program was established.

Contact Information:

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URL: http://www.capp.ca

No Graphic Available

Record Number: 014

Research Category: PROCEDURES

Improvement Reference: Evaluate "in-place" plans and efforts of offshore emergency response

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 20-46-47-49

Effective Date: November 1984

Title: An Overview Report

Author: G. R. Yungblut (for Canadian Petroleum Association, Offshore Operators' Division and East Coast Operators Management Committee)

Description:

An overview report on the efforts made by industry on the Canadian east coast to improve the safety and security of those working offshore and the capability to deal with an offshore emergency: progress and ongoing activities.

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URL: http://www.capp.ca

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Record Number: 015

Research Category: PROCEDURES

Improvement Reference: Provision of Civilian Search and Rescue Helicopter Capability

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 114

Effective Date: November 1984

Title: Position Paper on Implementation of a Civil Air Search and Rescue Service Dedicated to the Support of the East Coast Offshore Oil Industry

Author: Canadian Petroleum Association – Offshore Operators Division

Description:

The Department of National Defense was under extreme pressure to locate air Search and Rescue resources in St. John's. DND took the position that the SAR resources dedicated to the East Coast region were adequate. Public and government pressure turned to the offshore petroleum industry to provide an air SAR service in St. John's. This paper examines the requirement for and the implications of establishing a civil air SAR service dedicated to the support of the oil industry operating off the East Coast of Canada.

Contact Information:

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URL: http://www.capp.ca

No Graphic Available

Record Number: 016

Research Category: PROCEDURES

Improvement Reference: Study Conducted on the Various Helicopter and Ship Methods of Recovering Survivors from Lifeboats

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 43

Effective Date: December 1984

Title: Report on the Transfers of Personnel from Lifeboats and Liferafts

Author: Captain H. Allan

Description:

This report presents the results of a study regarding the recovery of personnel from lifeboats at sea, in particular through the capabilities of two rescue platforms: Helicopter (Military or Civilian) and the designated standby/rescue vessel.

Contact Information:

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Calgary, Alberta, Canada T2P 3N9
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URL: http://www.capp.ca

No Graphic Available

Record Number: 017

Research Category: STANDARD

Improvement Reference: Federal Government Adjust SAR Coverage for Winter operations

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 53 & 54

Effective Date: December 1984

Title: Search and Rescue Increase

Journal: Eastern Offshore News, Vol. 6, No. 3, December 1984 (pp 8-9)

Description:

Minister of Energy, Mines and Resources announced that the federal government is to increase its Search and Rescue capability stationed in St. John's. This will consist of a helicopter flight detachment from Gander with an attached maintenance capability, rotated through St. John's during the winter weather season.

This proximity to the fishing and petroleum exploration areas will reduce flight times and the need to refuel in St. John's after having made the transit from Gander.

Contact Information:

National Resources Canada
Energy Sector – Frontier Lands Management
17th Floor, Section A6
580 Booth Street, Ottawa, Ontario
Canada K1A 0E4
Tel: (613) 995-0287
Fax: (613) 992-8738
URL: http://www.nrcan-rncan.gc.ca

No Graphic Available

Record Number: 018

Research Category: COMMUNICATION

Improvement Reference: Report on the status of the activities pursuant to the Industry Safety Task Force Recommendations

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: Various

Effective Date: December 1984

Title: Assessment of the Status of the Recommendations of the Offshore Safety Task Force

Journal: Eastern Offshore News, Vol. 6, No. 3, December 1984

Description:

In September 1984 a report was compiled by a consultant for the Offshore Operators Division, CPA, which assessed the status of the activities recommended by the Task Force. The report includes a detailed progress report of each of the 55 recommendations.

The analysis shows that the East Coast Offshore Industry has either completed or is currently working on 95 percent of the Task Force recommendations.

Contact Information:

Canadian Association of Petroleum Producers
Suite 2100, 350 7th Avenue S.W.
Calgary, Alberta, Canada T2P 3N9
Tel: (403) 267-1100
Fax: (403) 261-4622
E-Mail: communication@capp.ca
URL: http://www.capp.ca

No Graphic Available

Record Number: 019

Research Category: TECHNOLOGY

Improvement Reference: Study of existing evacuation technology recommends a new approach be taken

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: December 1984

Title: Report on Means of Improving the Capability and Reliability of Present Lifeboats and Lifeboat Launching on Mobile Offshore Drilling Units

Author: J. Henley

Description:

This study evaluated the potential opportunities to enhance the existing lifeboat evacuation systems in use on the East Coast. The report indicated that only marginal improvements could be made to existing technology and that a new approach should be developed.

The report also indicated that Lifeboat Coxswain training should be upgraded to include theory elements of launching lifeboats in severe weather conditions.

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Canadian Association of Petroleum Producers
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Calgary, Alberta, Canada T2P 3N9
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Fax: (403) 261-4622
E-Mail: communication@capp.ca
URL: http://www.capp.ca

No Graphic Available

Record Number: 020

Research Category: PROCEDURES

Improvement Reference: Investigation of Potential Refinements to the Existing Personnel Transfer Capability

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22

Effective Date: December 1984

Title: Evacuation to Standby Vessels by Drilling Unit Crane

Author: G. R. Yungblut, EPI Resources Ltd.

Description:

This report evaluates the existing crane technologies present on the offshore East Coast drilling units, and what company procedures are in place to conduct evacuations by crane transfer. Critical factors for success were identified and options for improving the current capability were discussed.

Contact Information:

Canadian Association of Petroleum Producers
Suite 2100, 350 7th Avenue S.W.
Calgary, Alberta, Canada T2P 3N9
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Fax: (403) 261-4622
E-Mail: communication@capp.ca
URL: http://www.capp.ca

No Graphic Available

Record Number: 021

Research Category: PROCEDURES

Improvement Reference: Assessment of East Coast Standby/ Rescue vessel capability to recover survivors

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 47

Effective Date: January 1985

Title: Ability of a Standby Supply Vessel to Recover Persons From the Sea

Author: Cord Group Limited/Canadian Petroleum Association, Offshore Operators Division

Report: CPA-OOD-ECOMC No. 104

Description:

The purpose of the study was to assess the current capability of standby supply vessels to recover persons from the sea and identify factors that limit this capability and propose methods of improvement.

Contact Information:

Canadian Association of Petroleum Producers
Suite 2100, 350 7th Avenue S.W.
Calgary, Alberta, Canada T2P 3N9
Tel: (403) 267-1100
Fax: (403) 261-4622
E-Mail: communication@capp.ca
URL: http://www.capp.ca

No Graphic Available

Record Number: 022

Research Category: TECHNOLOGY

Improvement Reference: Global Current Generation Evacuation Systems Reviewed

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: March 1985

Title: Integrated Lifesaving System

Author: Newfoundland Ocean Consultants Limited for National Research Council

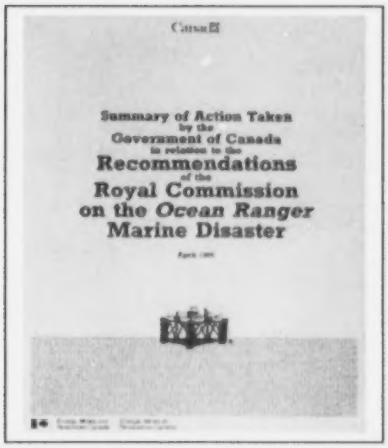
Description:

This report takes a fresh look at the survival system problems and proposed potential solutions. Different survival systems are defined, researched, analyzed and judged against the practical requirement of rescue.

Technologies of interest included dry transfer options (gangbridge), TEMPSC launching systems and semi-dry liferaft technology.

Contact Information:

National Research Council
Institute for Ocean Technology
PO Box 12093
St. John's, NL, Canada A1B 3T5
Tel: (709) 772-4939
URL: http://www.nrc-cnrc.gc.ca/institutes/iot_e.html



Record Number: 023

Research Category: COMMUNICATION

Improvement Reference: Summary of Current Responses to the *Ocean Ranger* Recommendations

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: Various

Effective Date: April 1985

Title: Summary of Action Taken by the Government of Canada in relation to the Recommendations of the Royal Commission on the *Ocean Ranger* Marine Disaster

Author: Energy, Mines and Resources Canada

Description:

This report established the current status of the Federal Government series of activities undertaken in response to the RCOMD Report One Recommendations (66 individual recommendations).

Contact Information:

Natural Resources Canada
580 Booth Street, 14th Floor, Section D-2
Ottawa, Ontario Canada K1A 0E4
Tel: (613) 947-3481
Fax: (613) 995-6146
E-Mail: oerd.brde@nrcan.gc.ca
URL: http://www2.nrcan.gc.ca

Record Number: 024

Research Category: TECHNOLOGY

Improvement Reference: Survey of Offshore Drilling Unit Evacuation Systems Volumes 1 and 2

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: May 31, 1985

Project Participants/Sponsors:

Memorial University
Canadian Coast Guard

Description:

The report, conducted by Memorial University of Newfoundland, undertook a survey of all currently available evacuation systems, nationally and internationally, used on offshore drilling units, as well as those currently under development by oilrig owners, operators, manufacturers and other groups. The report covers dry, semi-wet and wet systems.

The report concluded that:

- Dry evacuation systems are clearly to be preferred over semi-wet or wet systems.
- Evaluation of several of the various systems may best be done by comprehensive hydrodynamic model tests.
- A number of field trials of the most promising systems should be made under East Coast conditions.
- Constant vigilance over the maintenance of such systems and the proper training of personnel in the operation of the systems in emergency conditions is of paramount importance.

Contact Information:

Transport Canada
Tower C, Place de Ville,
330 Sparks Street
Ottawa, Ontario, Canada, K1A 0N5
Tel: (613) 990-2309
URL: http://www.tc.gc.ca/marine

Record Number: 025

Research Category: PROCEDURES

Improvement Reference: Royal Commission on the *Ocean Ranger* Marine Disaster Report Two

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: N / A

Effective Date: June 1985

Title: Report Two: Safety Offshore Eastern Canada (Three Volumes)

Author: Royal Commission on the *Ocean Ranger* Marine Disaster (Hickman Commission)

Description:

This Report presents the findings, conclusions and recommendations of the Royal Commission on the *Ocean Ranger* Marine Disaster, as they relate to the investigation and evaluation of the state of offshore safety systems and organizational preparedness in the aftermath of the loss of the *Ocean Ranger* and crew.

The Report published 70 recommendations, many of which are the focus of this research report.

Contact Information:

Canada-Newfoundland and Labrador Offshore Petroleum Board
5th Floor TD Place, 140 Water Street,
St. John's, NL, Canada A1C 6H6
Tel: (709) 778-1400
E-mail: Postmaster@cnlopb.nl.ca
URL: http://www.cnlopb.nl.ca

No Graphic Available

Record Number: 026

Research Category: TECHNOLOGY

Improvement Reference: Evaluation of current global evacuation systems (dry, semi-dry and wet categories) for potential use in Canada

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: August 1985

Title: Draft Interim Report – Evacuation Systems R&D Program – Phase I

Author: G. R. Yungblut, EPI Resources Ltd.

Description:

This report describes the work done to date in preparing a research and development program for evacuation systems from mobile offshore drilling units. It contains preliminary conclusions and recommendations with respect to the concepts/systems that warrant further study and a method for carrying out such studies.

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E-Mail: communication@capp.ca
URL: http://www.capp.ca

No Graphic Available

Record Number: 027

Research Category: TECHNOLOGY

Improvement Reference: Study of International Standby/ Rescue Vessels

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 43

Effective Date: September 1985

Title: Standby Vessel Study (2 Volumes)

Author: Craigmore Offshore Ltd. (for the Ship's Safety Branch, Canadian Coast Guard)

Description:

The objectives of this study were to carry out a literature search on the subject of standby vessels for offshore installations, identify and assess the major studies related to standby vessels rules, standards, guidelines and regulations and to make recommendations on the functions, suitability and capability of standby vessels attending offshore installations on the East Coast of Canada.

Contact Information:

Transport Canada
Tower C, Place de Ville,
330 Sparks Street
Ottawa, Ontario, Canada, K1A 0N5
Tel: (613) 990-2309
URL: http://www.tc.gc.ca/marine

No Graphic Available

Record Number: 028

Research Category: TECHNOLOGY

Improvement Reference: Marine Evacuation Systems and Support Equipment

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: October 1985

Title: MODU Evacuation Systems Research and Development (Program Alternatives)

Author: Canadian Petroleum Association, Offshore Operators Division

Report: CPA/OOD/ECOMC – Report #110

Description:

This report describes a proposed research and development program for evacuation systems from mobile offshore drilling units (MODUs) and contains recommendations with respect to the concepts/systems that warrant inclusion in such a program. It also contains conclusions regarding the nature of the program and a plan for organizing and implementing the suggested course of action.

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No Graphic Available

Record Number: 029

Research Category: COMMUNICATION

Improvement Reference: Summary of Industry Activities in Support of the RCOMD Recommendations

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: Various

Effective Date: December 1985

Title: CPA Response to the Recommendations of the Royal Commission on the Ocean Ranger Marine Disaster – Report Two

Journal: Eastern Offshore News, Vol. 7, No. 3, December 1985 (pp 2-5)

Description:

Discusses the Canadian Petroleum Association (now Canadian Association of Petroleum Producers) response to the Report Two recommendations 67-136 made by the RCOMD, including details on ongoing research and development of offshore escape and evacuation systems.

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URL: http://www.capp.ca

Record Number: 030

Research Category: TECHNOLOGY

Improvement Reference: Preferred Orientation & Displacement Lifeboat Launching System

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: December 1985

Title: Preferred Orientation and Displacement (PrOD) Project
Phase 1 Preliminary Report

Author: F. C. Leafloor, G. B. Yeo

Description:

Preliminary report detailing the work of the jointly funded (Industry-Government) full scale sea trials of the PrOD system using a 22–person lifeboat at sea on the Grand Banks, conducted July-December 1985.

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URL: http://www.capp.ca

No Graphic Available

Record Number: 031

Research Category: TECHNOLOGY

Improvement Reference: Review of International Dry, Semi-Dry and Wet Evacuation System Technologies

Area of Impact: International

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: 1985

Title: Follow Up Report to Evacuation Systems and Equipment for Mobile Offshore Drilling Rigs

Author: Canadian Petroleum Association / Memorial University

Description:

Updating of the earlier DnV report on international evacuation systems in conceptual development, proving trials or implemented offshore stages. The report re-visited the previous technologies investigated by DnV and researched new innovative approaches and equipment recently available.

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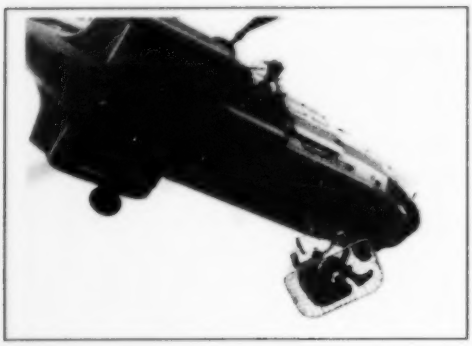
URL: http://www.capp.ca



Record Number: 032

Research Category: PROCEDURES

Improvement Reference: Industry Self-Help Air Rescue Capability (Grand Banks)

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 114

Effective Date: 1985

Title: Proposal for a Search and Rescue Service on Canada's East Coast

Author: Sealand Helicopters

Description:

Sealand Helicopters responded to the RCOMD Recommendation 114 with a proposal for the Minister of National Defence to contract industry commercial helicopters for offshore industry self-help Search and Rescue.

Industry later funded its own "active mode" Search and Rescue capability, primarily for operations on the Grand Banks of Newfoundland, however the equipment and training were also available for Scotian Shelf operations. The Scotian Shelf petroleum operators focused their attention to an emergency services base (helicopter refueling capability and survivor accommodations/supplies) on Sable Island.

Contact Information:

Canadian Helicopter Corporation (CHC)
4740 Agar Drive,
Richmond, BC, Canada V7B 1A3
Tel: (604) 276-7500
E-Mail: communications@chc.ca
URL: http://www.chc.ca

No Graphic Available

Record Number: 033

Research Category: TECHNOLOGY

Improvement Reference: Evacuation System Technology Research Planning Report

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: Various

Effective Date: September 1985

Title: Draft Report to ECOMC on an R&D Program (Phase 1) for Evacuation Systems

Author: G. R. Yungblut
CPA, Eastcoast Operators R&D Steering Group

Description:

This report describes a proposed research and development program for evacuation systems from MODUs and contains recommendations with respect to the concepts/systems that warrant inclusion in such a program. It also contains conclusions regarding the nature of the program and a plan for organizing and implementing the suggested course of action.

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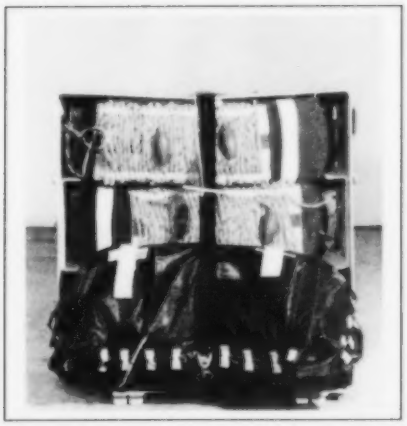

Record Number: 034

Research Category: TECHNOLOGY

Improvement Reference: Helicopter-deployed survival technology to assist personnel in the sea

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 114

Effective Date: January 1986

Title: Stand-Off Emergency Assistance (S.E.A.) Kit – Modification and Trial Project

Author: CORD Group Limited (for Petro-Canada Resources)

Description:

Final Full Scale Field Trials, conducted to confirm hover-deployment techniques and SEA Kit associated equipment to make the deployment more easily achievable and with greater accuracy with respect to survivors in the water.

Contact Information:

Petro-Canada
150 - 6th Avenue S.W.
Calgary, AB, Canada T2P 3E3
Tel.: (403) 296-8000
Fax: (403) 296-3030
URL: http://www.petro-canada.ca

W.A.T.E.R. Associates
702 Old Sackville Road
Lower Sackville NS, Canada B4C 2K3
E-Mail: LBell@water-research.com

No Graphic Available

Record Number: 035

Research Category: TECHNOLOGY

Improvement Reference: Helicopter Deployed Survival Technology to assist personnel in the sea

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 114

Effective Date: January 1986

Title: Airborne Rescue Kit MK1 Manual and Amendment

Author: Helicopter Survival Rescue Services Limited

Description:

The Airborne Rescue Kit (ARK) is a primary rescue device designed to be dropped from a helicopter or seagoing vessel in an emergency. The kit is assembled in 2 components, each component consisting of one inflatable liferaft and one accessory kit (survival equipment). The two components may be linked together to be deployed in a horse-shoe configuration at sea, allowing the rafts and the accessory kits to drift down onto a group of in-water survivors.

Contact Information:

HSRS (Formerly: Helicopter Survival Rescue Services Ltd.)
Aviation Division
81 Ilsley Avenue, Unit 7,
Dartmouth, NS, Canada B3B 1L5
Tel: (800) 565-8677 Ext.24
Fax: (902) 468-3083
E-Mail: avaiation@hsrs.ca
URL: http://www.hsrs.ca

No Graphic Available

Record Number: 036

Research Category: TECHNOLOGY

Improvement Reference: Understanding Immersion Suit Requirements

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 109

Effective Date: March 1986

Title: Ship/Rig Personnel Abandonment and Helicopter Crew/Passenger Immersion Suits: The Requirements in the North Atlantic

Author: C. J. Brooks

Description:

Protection from hypothermia and drowning are the primary requirements for an immersion suit system during ship, rig, or helicopter abandonment in the North Atlantic. In order to achieve this, the suit must be dry and comfortable. The problems that are involved in manufacturing such a suit are discussed. The author identifies that there is still not a suit in existence that fulfills all of the selection criteria.

Contact Information:

Dr. C.J. Brooks
Survival Systems Limited
50 Mount Hope Avenue
Dartmouth, NS, Canada B2Y 4K9
Tel: (800) 788-3888
(902) 465-0888
Fax: (902) 465-1271
E-Mail: albert@survivalsystems.info
URL: http://www.survivalsystemsgroup.com

No Graphic Available

Record Number: 037

Research Category: TECHNOLOGY

Improvement Reference: Summary of current research/development activity regarding East Coast Offshore MODU Escape and Evacuation Systems

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22, 107, 114

Effective Date: April 1986

Title: Update to MODU Evacuation System Research and Development Program Alternatives

Journal: Eastern Offshore News, Vol. 8, No. 1, April 1986 (pp 19-20)

Description:

Progress update regarding ongoing investigations into various systems including PrOD Lifeboat Launching System, modified liferaft systems, dry transfer systems (gangbridges, crane transfers), freefall lifeboats and the GEMEvac Gondola Wire Transfer System.

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URL: http://www.capp.ca

No Graphic Available

Record Number: 038

Research Category: PROCEDURES

Improvement Reference: Federal Government establishment of the Search and Rescue New Initiatives Fund

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 54

Effective Date: April 1986

Title: Search And Rescue New Initiatives Fund – Contribution Program in Support of the Search and Rescue New Initiatives Fund

Author: National Search and Rescue Secretariat

Description:

In 1986, the Federal Cabinet, acting on two of the recommendations of the RCOMD, recognized the National SAR Program as a distinct horizontal program of the government and confirmed the Minister of National Defence as the Lead Minister for Search and Rescue, with overall policy responsibility for SAR and authority, responsibility and accountability for the coordination of the National SAR Program.

The government established the SAR New Initiatives Fund (SAR NIF) as an independent source of funds to develop and advance National SAR Program initiatives and policies. SAR NIF provides funding for new initiatives in the SAR area to provincial and territorial governments, for-profit and not-for-profit Canadian organizations from the volunteer, academic or private sectors and individuals with responsibilities in the National SAR Program. The program is regularly updated, last amendments to date made in 2005.

Contact Information:

National Search and Rescue Secretariat
400-275 Slater Street,
Ottawa, ON, Canada K1A 0K2
Tel: (800) 727-9414
Fax: (613) 996-3746
URL: http://www.nss.gc.ca

No Graphic Available

Record Number: 039

Research Category: TECHNOLOGY

Improvement Reference: Fast Rescue Craft Personnel Rescue Systems Technology Review

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 43

Effective Date: May 1986

Title: Fast Rescue Craft Launch/Recovery System Project Report

Author: Working Group of the East Coast Operators Logistic Committee

Description:

Project was initiated by the East Coast Operators Logistic Committee in order to further develop and improve the capability of supply vessels to launch and recover an FRC.

The principle aims of the project were to attempt to quantify the existing capability and ascertain what capability should reasonably be expected using existing technology. In addition, other factors which contribute to a supply vessel's FRC deployment potential such as the crew's specialty training and attitude to FRC use were assessed.

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Record Number: 040

Research Category: TECHNOLOGY

Improvement Reference: Workshop Conducted on Sea Rescue Technologies and Future Research Opportunities

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 44, 46, 113

Effective Date: June 1986

Title: Safety Technology – Emergency Equipment and Sea Rescue Techniques

Author: Canada Oil and Gas Lands Administration

Description:

This workshop assembled the offshore petroleum industry organizational leaders and researchers to plan for the PERD Task 6.2 continuing research effort in escape, evacuation and rescue technologies and procedures.

Areas of discussion included PrOD, Personnel Transfer Basket technologies, Arctic escape systems, Fast Rescue Craft capabilities, Immersion suit technology, and diving safety technology enhancements.

Contact Information:

Natural Resources Canada
(Office of Energy Research and Development)
(Panel on Energy Research and Development)
580 Booth Street, 14th Floor, Section D-2
Ottawa, Ontario Canada K1A 0E4
Tel: (613) 947-3481
Fax: (613) 995-6146
E-Mail: oerd.brde@nrcan.gc.ca
URL: http://www2.nrcan.gc.ca/es/oerd/

No Graphic Available

Record Number: 041

Research Category: REGULATION

Improvement Reference: Offshore Safety Enhancement Through Regulatory Reform

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 80

Effective Date: July 1986

Title: The Promotion and Enhancement of Safety in Oil and Gas Operations on Canadian Frontier Lands – Equipment, Procedures, Personnel

Author: R. J. Harrison; D. N. Mainguy; A. E. Pallister

Description:

This report summarizes the regulatory development work to support strengthening the regulatory process with regard to safety in oil and gas operations on Canada Frontier Lands. While the RCOMD recommendations related mainly to the East Coast, the Federal Government established a Task Force expressly directed to examine both drilling and production facilities used in oil and gas operations anywhere on frontier lands.

The Task Force supported the RCOMD recommendation of an omnibus legislation (the future "Canada Oil and Gas Operations Act") and a single regulatory agency to oversee oil and gas activity.

Contact Information:

Natural Resources Canada
Frontier Lands Management
580 Booth Street, 17th Floor, Section A-6
Ottawa, ON, Canada K1A 0E4
Tel: (613) 995-0287
Fax: (613) 992-8738
URL: http://www.nrcan-rncan.gc.ca

No Graphic Available

Record Number: 042

Research Category: TECHNOLOGY

Improvement Reference: Helicopter Immersion Suit Evaluations

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 109

Effective Date: August 1986

Title: Helicopter Transport Suit Test

Author: Paladin Consultants Limited

Description:

To support a clearer understanding of the capabilities of helicopter transportation suit systems, the three (at the time) approved suits were tested through in-water evolutions and a comparison report developed.

Contact Information:

Paladin Resources Limited
310 Gleneagles Drive
Orange Park, FL, USA 32073-4237
Tel: (904) 610-7504
E-Mail: paladinius@comcast.net

No Graphic Available

Record Number: 043

Research Category: TECHNOLOGY

Improvement Reference: Comparative Assessment of Freefall Marine Evacuation Systems

Area of Impact: International

Organization Category: Research

Royal Commission Recommendation: 107

Effective Date: October 1986

Title: The Performance of Free-Fall Lifeboats in the Context of Offshore Evacuation Systems

Author: K. A. Abrams (Newcastle University)
Paper presented at Joint International Conference on Escape, Survival Rescue at Sea, Royal Aeronautical Society, London

Description:

Research-based critical analysis of the benefits and drawbacks of the freefall lifeboat launching system in comparison with the traditional "cable launched" TEMPSC. A review of the most recent (at the time) emergency evacuations was presented and a discussion of each was conducted.

Contact Information:

Royal Institution of Naval Architects
10 Upper Belgrave Street,
London, England, SW1X 8BQ
Tel: (+44) 20 7235 4622
Fax: (+44) 20 7259 5912
E-Mail: hq@rina.org.uk
URL: http://www.rina.org.uk

No Graphic Available

Record Number: 044

Research Category: TECHNOLOGY

Improvement Reference: MODU-to-vessel Direct Transfer Liferaft Evacuation System

Area of Impact: International

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: October 1986

Title: A Dry Evacuation System

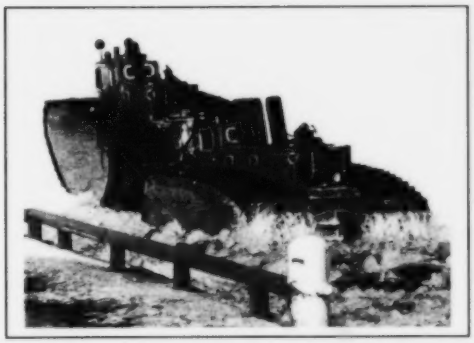
Author: R. P. Kent, Mobil North Sea Limited
Paper presented at Joint International Conference on Escape, Survival Rescue at Sea, Royal Aeronautical Society, London

Description:

A paper examining the modifications made to a davit launched liferaft for direct transfer of evacuees directly from the installation to the deck of the attendant standby/rescue vessel, and acceleration/impact tests conducted at the Transport and Road Research Laboratory using anthropomorphic dummies.

Contact Information:

ExxonMobil Canada East
Suite 1000, 1701 Hollis Street
Halifax, NS Canada B3J 3M8
Tel: (902) 490-8900



Record Number: 045

Research Category: TECHNOLOGY

Improvement Reference: Development and Full Scale Field Trials of a Motorized Arctic Evacuation System

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: October 1986

Title: The Arctic Escape System Project

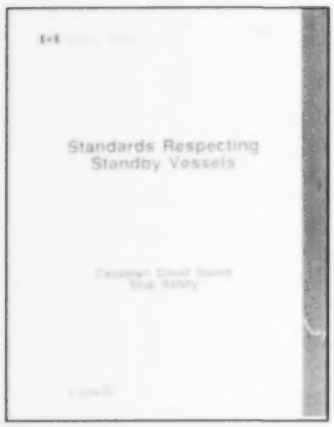
Author: Bruce H.W.J. Seligman
Presented at Arctic Offshore Technology Conference, Calgary

Description:

A full scale prototype rescue vehicle called ARKTOS was designed and built to meet the desire for an improved evacuation system capable of operating in the Beaufort Sea. Full Scale field trials were conducted in ice and ice-water interface conditions.
(The craft is now in international service.)

Contact Information:

ARKTOS Developments Ltd.
12634 – 82nd Avenue
Surrey, BC, Canada V3W 3G1
Tel: (604) 599-4989
Fax: (604) 599-4941
E-Mail: info@arctoscraft.com
URL: http://www.arctoscraft.com



Record Number: 046

Research Category: STANDARD

Improvement Reference: Performance standards established for Standby/Rescue vessels in Canada

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 44, 47, 113

Effective Date: October 1986

Title: Standards Respecting Standby Vessels (TP 7920E)

Author: Transport Canada

Description:

This standard establishes the operational requirements for vessels to conduct the standby/ rescue role for offshore installations. Elements include: vessel structure, propulsion, maneuverability, personnel capacity (including survivors), lifesaving equipment types and numbers, enhanced medical care facilities and equipment, capability to recover persons from the sea (including the carriage of a Fast Rescue Craft and specially-trained crew).

The standard also establishes the operational posture of the standby vessel in terms of readiness to respond and training and preparedness of the crew, limitations on cargo types and on the arrangement of cargo on deck when assuming the standby mode.

The standard was originally issued in 1986 and revised in October 1988. The October 1988 version remains the current version at the time of the writing of this report.

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Transport Canada
Tower C, Place de Ville,
330 Sparks Street
Ottawa, Ontario, Canada, K1A 0N5
Tel: (613) 990-2309
URL: http://www.tc.gc.ca/marine

Record Number: 047

Research Category: TECHNOLOGY

Improvement Reference: Preferred Orientation & Displacement (PrOD) Lifeboat Launching System

Area of Impact: Canada / International

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: February 1987

Title: Preferred Orientation and Displacement Lifeboat Launching System

Author: F. C. Leafloor; G. B. Yeo; R. MacDonald

Description:

The Preferred Orientation and Displacement lifeboat launching device concept was first developed in England in the late 1970's, but did not move beyond conceptual drawings, initial engineering and small-scale modeling. Recognizing the damage inflicted upon the *Ocean Ranger* lifeboats during the abandonment, the East Coast offshore petroleum industry investigated areas of likely performance improvement. The PrOD technology of the flexible boom and hydraulics was a relatively basic technology, with minimal weight penalty and, once the concept could be proven in full scale testing in severe weather, was readily able to be retro-fitted to existing MODUs then working on Canada's East Coast.

Two years of modeling research and full scale tests by a joint industry and government research effort through the Panel on Energy Research and Development (PERD) culminated in Transport Canada approving the PrOD technology for use on Canadian and foreign-flagged semi-submersible MODUs operating in Canadian waters. PrOD is in use on MODUs and production installations operating in waters under the jurisdiction of the Canada – Newfoundland & Labrador Offshore Petroleum Board (C-NLOPB).

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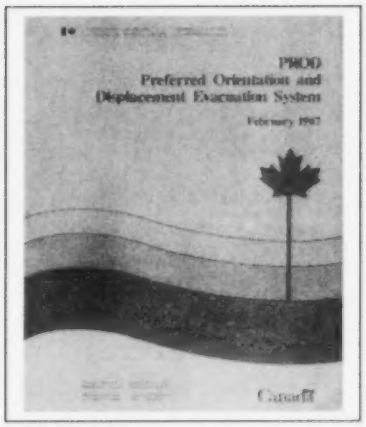
E-mail: schat-harding@umoe.no
URL: www.schat-harding.com



Record Number: 048

Research Category: TECHNOLOGY

Improvement Reference: Lifeboat Orientation and Displacement Launch Assist System

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: February 1987

Title: Preferred Orientation and Displacement Evacuation System (PrOD)
EPB Technical Report No. 11

Author: F.C. Leafloor, G. B. Yeo
Energy, Mines and Resources Canada/COGLA

Description:

The PrOD system is the result of strong efforts of government and industry to identify, develop and prove a safe method of personnel evacuation from drilling rigs. The PrOD program responded to RCOMD Recommendation 22, which stated that utmost priority be given to the development of safe evacuation systems for foreseeable emergency and storm conditions. The report includes overview descriptions of the system, summaries of the testing process and challenges encountered, conclusions and recommendations.

This Volume is the main technical report.

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Fax: (613) 995-6146
E-Mail: oerd.brde@nrcan.gc.ca
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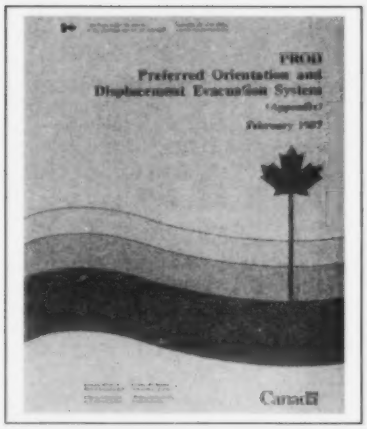

Record Number: 049

Research Category: TECHNOLOGY

Improvement Reference: Lifeboat Orientation and Displacement Launch Assist System

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: February 1987

Title: Preferred Orientation and Displacement Evacuation System (PrOD)
EPB Technical Report No. 12

Author: F.C. Leafloor, G. B. Yeo
Energy, Mines and Resources Canada/COGLA

Description:

The PrOD system is the result of strong efforts of government and industry to identify, develop and prove a safe method of personnel evacuation from drilling rigs. The PrOD program responded to RCOMD Recommendation 22, which stated that utmost priority be given to the development of safe evacuation systems for foreseeable emergency and storm conditions. The report includes overview descriptions of the system, summaries of the testing process and challenges encountered, conclusions and recommendations.

This Volume is the Appendix to the main technical report.

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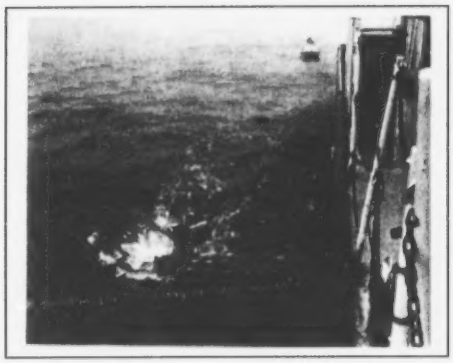

Record Number: 050

Research Category: TECHNOLOGY

Improvement Reference: Lifeboat Occupant Recovery System (LORS) Full Scale Trials

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 43 & 112

Effective Date: May 1987

Title: LORS: Lifeboat Occupant Recovery System 22-Person TEMPSC Offshore Sea Trials, Low Sea States (Phase 1) 1986

Author: F. C. Leafloor; G. B. Yeo

Description:

The Lifeboat Occupant Recovery System is designed to provide an intermediate rescue capability for vessels presently unable to recover a lifeboat directly from the sea. This concept has completed the first phase of proof of concept testing. (Phase 1 in low sea states). The system assumes that the TEMPSC has been successfully launched and cleared the platform. The need for such a system was in part due to the failures and fatalities that had occurred in transferring crew to the rescue craft or in towing the TEMPSC and in part due to the increased limits on environmental conditions within which the TEMPSC could be launched following the development of systems such as PrOD.

The LORS concept is fairly simple. It provides for a remote connection of a towline from rescue vessel to the lifeboat, a method to draw the lifeboat, under control, into a stabilizing connection attached to the rescue vessel, and options for the direct transfer of the survivors to the safety of the vessel's deck.

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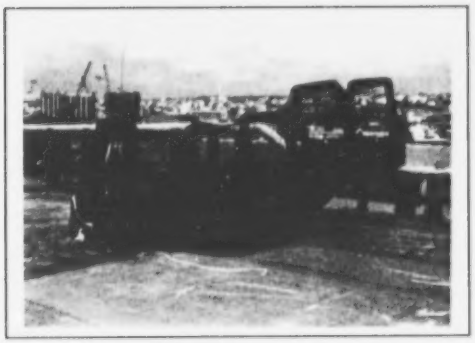
URL: http://www.huskyenergy.ca



Record Number: 051

Research Category: TECHNOLOGY

Improvement Reference: Lifeboat Occupant Recovery System (LORS) Full Scale Trials

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 43 & 112

Effective Date: May 1987

Title: Lifeboat Occupant Recovery System (LORS Project) 22-Person Lifeboat Interim Report

Author: F.C. Leafloor; G. Yeo; D. Sellars

Description:

The successful completion of the PrOD Bow Drill 3 Lifeboat Test Program made it essential to supplement the lifesaving capabilities inherent in the PrOD system with a Lifeboat Occupant Recovery System (LORS) and weave the two systems into a concept providing a more effective lifesaving capability.

This interim report represents the first stage of field test and evaluation of the LORS concept using a 22-person Totally Enclosed Motor Propelled Survival Craft (TEMPSC) and two types of inflatable transfer ramps.

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No Graphic Available

Record Number: 052

Research Category: TECHNOLOGY

Improvement Reference: United Kingdom Full Scale Trials of PrOD Evacuation System

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: August 1987

Title: UK PrOD Trials Undertaken on Self Propelled Semi Submersible Drilling Vessel, Aladdin

Author / Editor: Design Management Consultants Limited (Prepared and published on behalf of the PROD Work Group, supported in part by the U.K. Department of Energy)

Description:

The objectives of this study were:

- To obtain further data from full scale trials offshore to consolidate information obtained from Model Tests and Canadian trials
- Quantify performance benefits
- Determine effectiveness of the system at heights above sea level
- Obtain additional performance data
- Evaluate performance of the PROD system
- Determine further work required

This report covers offshore PROD trials carried out on a semi-submersible Drilling Rig (Aladdin) six miles off Aberdeen in April and May 1987. These trials were jointly funded by the U.K. Department of Energy and various industrial sponsors. Following the end of the trials, the results were given to the Institute of Offshore Engineering at Heriot-Watt University for independent assessment.

Contact Information (circa 1987):

UK Department of Energy (not current)
Design Management Consultants Ltd.
Nr. Rugby, Warwickshire, England CV23 8DX
(+44) 0926 633143

No Graphic Available

Record Number: 053

Research Category: TECHNOLOGY

Improvement Reference: Alternative Crane-Deployed Personnel Transfer Device, applicable for use During Evacuation

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: August 1987

Title: Personnel Transfer System (P.T.S.) Offshore Field Trials August 1987

Author: G. Yeo, Paladin Resources Limited

Description:

Results of tests carried out on the Paladin Resources second-generation Full Scale Personnel Transfer Apparatus (PTA) prototype. The tests were carried out offshore in low to moderate sea states.

Further proof-of-concept trials are scheduled for heavier sea states and wind conditions.

Contact Information:

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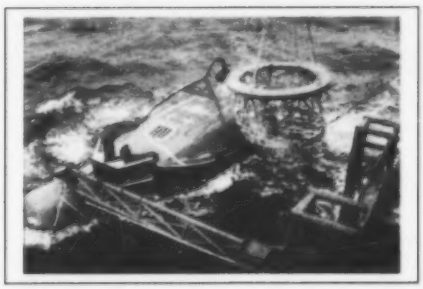

Record Number: 054

Research Category: TECHNOLOGY

Improvement Reference: Survivor Rescue from TEMPSC Technology and Procedure

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 47

Effective Date: October 1987

Title: Lifeboat Occupant Recovery System (LORS) Field Trials Report (Moderate Sea States)

Author: F. C. Leafloor, Husky Bow Valley
Paper presented at International Offshore Safety Conference, London 1987

Description:

The Lifeboat Occupant Recovery System is designed to provide an intermediate rescue capability for vessels presently unable to recover a lifeboat directly from the sea. This concept has completed proof of concept testing. (Phase 2 in moderate sea states).

The LORS concept provides for a remote connection of a towline from rescue vessel to the lifeboat, a method to draw the lifeboat, under control, into a stabilizing connection attached to the rescue vessel, and options for the direct transfer of the survivors to the safety of the vessel's deck.

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Record Number: 055

Research Category: TECHNOLOGY

Improvement Reference: Alternative Crane-Deployed Personnel Transfer Device, applicable for use During Evacuation

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: December 1987

Title: Personnel Transfer System (P.T.S.) Offshore Field Trials (Moderate Sea States)

Author: G. Yeo, Paladin Resources Limited

Description:

Results of tests carried out on the Paladin Resources second-generation Full Scale Personnel Transfer Apparatus (PTA) prototype. The tests were carried out offshore between the MODU Bow Drill 3 and the standby vessel MV Trinity Bay.

The results of the well-instrumented field tests indicate that the PTS concept is viable, safe, and has excellent potential for use as a dry evacuation device in poor environmental conditions.

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TRANSPORT CANADA
MARINE

Record Number: 056

Research Category: COMMUNICATION

Improvement Reference: Offshore Safety Update to *Ocean Ranger* Recommendations

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: Various

Effective Date: 1987

Title: Five Years After the *Ocean Ranger*

Author: J. Lotz

Journal: Transpo, Vol. 10, No. 3 (1987): 14-16

Description:

The article discusses the Ocean Ranger disaster (1982) and the recommendations made to improve the safety in the offshore.

Drill rigs in the offshore must now comply with Canadian standards developed by the Canadian Coast Guard in conjunction with Canadian Oil and Gas Lands Administration (COGLA). Rigs must have dual ballast controls. Technology is also aiding safety. Design criteria must allow for the accumulated weight of ice caused by the freezing spray whipped from the sea. The interaction is being examined between ships and ice to determine the pressures exerted on the hulls, to aid in designing the most effective angles and shapes for resisting ice. Life boat launching is also being studied.

These improvements in design standards, operating conditions on rigs, training and technology are having an impact on the offshore drilling industry.

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URL: http://www.tc.gc.ca/marine

NATIONAL STANDARD OF CANADA
NORME NATIONALE DU CANADA
Helicopter Passenger Transportation Suit Systems
Combinaisons pour passagers d'hélicoptère

Record Number: 057

Research Category: STANDARD

Improvement Reference: Second Edition of the Helicopter Passenger Transportation Suit System Standard

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 109

Effective Date: January 1988

Title: Helicopter Passenger Transportation Suit Systems

Author: Canadian General Standards Board

Description:

This is the joint government-industry developed technical performance standard for the manufacture and testing of a Canadian Helicopter Passenger Transportation Suit System (immersion suit).

The original standard was issued in 1986 and this version will be further amended.

Contact Information:

Canadian General Standards Board
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11 Laurier Street
Gatineau, Quebec, Canada, K1A 1G6
Tel: (819) 956-0425 *or* 1-800-665-2472
Fax: (819) 956-5644
URL: http://www.pwgsc.gc.ca/cgsb/home/index-e.html

Record Number: 058

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems and Sea Rescue Workshop

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: May 1988

Title: Safety Technology: Emergency Equipment and Sea Rescue Techniques
PERD Task 6.2 Program Evaluation Workshop

Author: Canada Oil and Gas Lands Administration
Panel on Energy Research and Development

Description:

This report summarizes the proceedings of a workshop convened on May 26 and 27, 1988, in St. John's, Newfoundland and contains a list of R&D priorities for improvements in evacuation technology/sea rescue techniques appropriate for a three-year R&D program (1988-1991).

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URL: http://www2.nrcan.gc.ca/es/oerd/

No Graphic Available

Record Number: 059

Research Category: TECHNOLOGY

Improvement Reference: Non-Traditional Marine Evacuation Options for East Coast Canada

Area of Impact: International

Organization Category: Industry

Royal Commission Recommendation: 22-24-107

Effective Date: May 1988

Title: Presentation on North Sea Evacuation Systems

Author: Mobil Oil

Description:

This document reports on the advances made by Mobil North Sea and its government and academic research partners in the development and testing of three unique evacuation concepts that are being considered for adoption in Mobil's East Coast Canada operations:

- GEC Mechanical Handling "GEMEvac" Gondola Transfer System
- Mobil North Sea "Odele" Dry Evacuation Lifesaving Equipment
- Selantic Vertical Escape Chute System

The GEMEvac "batch-transfer" evacuation system underwent extensive trials in the North Sea in moderate and heavy sea states. Its performance was acceptable and the system was initially installed on the Hibernia Platform offshore Newfoundland. Later performance failures in July 1998 resulted in the system not receiving regulatory approval in Canada.

The ODELE liferaft transfer system was trialed extensively and an inflatable liferaft was substantially modified and instrumented to test the vertical impact loads transferred to the occupants, resulting from a hard landing on the deck of the attendant vessel. The ODELE was not adopted for offshore implementation.

The Selantic Escape Chute was re-marketed as the SkyScape SES and has been the subject of numerous research initiatives. The system is accepted for use in Canada, where many platform installations now have the system installed.

Contact Information:

Over the intervening years, the manufacturers of these products have changed identities. The most current contact information is provided below.

GEMEvac:

ALSTEC Ltd
(*Was*: GEC ALSTHOM Engineering Systems Ltd)
Cambridge Road, Whetstone
Leicester, United Kingdom LE8 6LH
Tel: (44) 116 2015223
Fax: (44) 116 201 5071
URL: http://www.alstec.com

ODELE (Offshore Dry Evacuation Lifesaving Equipment):

Dunlop Marine Safety Limited
Corporation Road
Birkenhead, Merseyside, United Kingdom. L41 8JX
Tel: (44) 151 653 6464
Fax: (44) 151 652 8276

Skyscape:

VIKING Life-Saving Equipment (Headquarters)
Saedding Ringvej 13
6710 Esbjerg V, Denmark
Tel: (45) 76 11 81 00
Fax: (45) 76 11 81 01
E-Mail: viking@viking-life.com
URL: http://www.viking-life.com

VIKING Life-Saving Equipment (America), Inc.
1400 NW 159 Street, Suite 101
Miami, FL 33136, U.S.A.
Tel: (305) 614-5800
Fax: (305) 614-5810
E-Mail: usasales@viking-life.com
URL: http://www.viking-life.com

Record Number: 060

Research Category: COMMUNICATION

Improvement Reference: Discussion of the UK Government PrOD Trials and System Certification

Area of Impact: International

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: May 1988

Title: The PrOD System – A Viable Alternative to Freefall

Journal: Safety at Sea, May 1988, Issue 239 (pp 38-39)

Description:

Following more than four years of research and development, which included full scale trials offshore Eastern Canada and in the North Sea, the Preferred Orientation and Displacement (PrOD) Lifeboat Launching System has received the British Department of Transport acceptance for fitting to offshore installations working on the UK continental shelf.

PrOD will work in a retro-fit mode for existing equipment or can be used in new build units.

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Redhill, Surrey UK RH1 1UP
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URL: http://www.fairplay.co.uk

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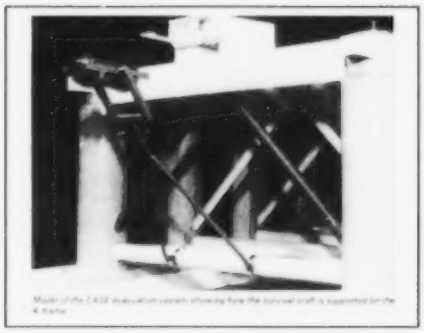

Record Number: 061

Research Category: TECHNOLOGY

Improvement Reference: Research Report on Computer Aided System of Evacuation (CASE)

Area of Impact: Canada/International

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: August 1988

Title: The CASE Evacuation System

Journal: Safety at Sea, August 1988, Issue 232 (pp 26-29)

Description:

As a result of Mr. Daniel O'Brien's presentation at the Safety at Sea and Marine Electronics Conference, considerable interest has been generated on the CASE system.

The primary structural components of the CASE consist of an A-frame, a cradle and a TEMPSC. The bottom of the A-frame is supported at two pivot points on an existing transverse girder at pontoon level on a semi-submersible mobile offshore unit.

The A-Frame extends upwards towards deck level, where at the peak of the A-Frame is supported a TEMPSC in a cradle. The TEMPSC is installed pointing away from the rig and the entry hatch at the stern is air-sealed against an enclosed passageway leading from the rig.

During an evacuation alarm, all persons proceed to the TEMPSC station via the enclosed passageway. When the passageway is cleared and all persons are strapped into their seats, the rear hatch is manually secured from inside the TEMPSC. The onboard computer senses the balance of the TEMPSC in the cradle and the Coxswain re-seats personnel as necessary to achieve optimum balance. When all is completed an Amber "ready" light is illuminated at the Coxswain position to indicate launch is possible at the coxswain's election.

Upon launch the cradle tilts outwards and, controlled by hydraulics or wires, the A-frame lowers the cradle and TEMPSC into the water, some distance away from the semi-submersible structure.

The cradle continues to sink below the TEMPSC, leaving the craft on the surface and able to maneuver. Upon water contact the computer starts the engine and guides the TEMPSC away from the rig. A Radio Direction Finder homes on a beacon activated onboard a standby vessel and the TEMPSC homes on the beacon to approach the rescue vessel.

Contact Information:

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E-Mail: dobrien@seascape2000.com

Fairplay International Shipping Weekly
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Redhill, Surrey UK RH1 1UP
Tel: +44 1737 379000
Fax: +44 1737 379001
E-Mail: info@fairplay.co.uk
URL: http://www.fairplay.co.uk

No Graphic Available

Record Number: 062

Research Category: TECHNOLOGY

Improvement Reference: Personnel Recovery from TEMPSC to Rescue Vessel

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 47

Effective Date: May 1988

Title: Lifeboat Occupant Recovery System (LORS) Status Update

Author: F. C. Leafloor, Husky/Bow Valley

Description:

Report on the initial Full Scale "proof of concept" sea trials for an innovative method of transferring lifeboat occupants from the TEMPSC to the ship rescue platform by way of an inflatable covered bridgeway.

The sea trials tested TEMPSC bow access and lateral access to the TEMPSC. Of larger import was the successful articulation of the LORS engagement boom that holds the TEMPSC in place while the rescue craft is making way between 4 to 6 knots. Transfers while underway assist the rescue ship to maintain a lee for the personnel transfers and stabilizes both ship and TEMPSC motions in a seaway.

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Record Number: 063

Research Category: TECHNOLOGY

Improvement Reference: Personnel Recovery from TEMPSC to Rescue Vessel

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 47

Effective Date: 1988

Title: Lifeboat Occupant Recovery System (LORS)
Phase 2 Trials 22 Person Lifeboat – Moderate Sea States

Author: F. C. Leafloor, Husky/Bow Valley

Description:

Phase 2 Full Scale sea trials were conducted to test new technologies for the recovery of persons from a TEMPSC at sea. Methods used were:

- Inflatable covered bridgeway (2 designs)
- EMPRA Rescue Basket
- "Horse-Collar" Rescue Harness

Additional technology developed was a remote towing attachment capability such that a rescue vessel could approach a TEMPSC in a seaway and attach a towing hook to a specially designed ring positioned at the water level of the TEMPSC – all conducted without the assistance of any of the TEMPSC occupants (who stay safely secured within the TEMPSC with all hatches closed).

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Record Number: 064

Research Category: COMMUNICATION

Improvement Reference: Summary of Ongoing Industry EER Research in December 1988

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: Various

Effective Date: January 1989

Title: Safety Response as a Result of the Sinking of the *Rowan Gorilla I*

Author: F. C. Leafloor

Description:

This report provides a key summary of all of the ongoing East Coast offshore industry activities with regard to the enhancement of safety at sea and in response to the RCOMD recommendations. With the loss of the *Rowan Gorilla I* in a mid-Atlantic storm while under tow in December 1988 – without loss of life or serious injury – both the government and the public shared a re-kindled interest in the progress of the industry responses to the RCOMD recommendations.

The report identified specific areas of industry research and development since the loss of the *Ocean Ranger* and crew that had a direct impact on the successful abandonment of the *Rowan Gorilla I*. Enhancements to personal survival training, provision of marine immersion suits, fitting of reliable communications devices within the TEMPSC, increased reliability of TEMPSC release equipment, more effective communications between military SAR assets and on-scene industry resources and the confidence of the crew in their equipment and themselves all contributed to the 100% survival rate for that sinking.

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CAN/CGSB-65.16-M89

Canadian General Standards Board

Marine Abandonment Immersion Suit Systems

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Record Number: 065

Research Category: STANDARD

Improvement Reference: CAN/CGSB 65.16-M89 Marine Abandonment Immersion Suit Systems

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 109

Effective Date: February 1989

Description:

The Canadian General Standards Board (CGSB) is one of the largest standards development and conformity assessment organizations in Canada. In existence since 1934, the CGSB is a component of the Government of Canada, Department of Public Works and Government Services.

The Marine Abandonment Immersion Suit System (commonly referred to as a "survival suit") design and use was in its infancy in both the commercial maritime industry and the offshore energy industry at the time of the loss, with all hands, of the *Ocean Ranger*.

A task group of the CGSB was formed to establish the Canadian requirements for Marine Abandonment Suit Systems and a provisional standard was released in the late 1980s (65-GP 16MP-88). A formal standard was promulgated in February 1989. This work was conducted in conjunction with, and in response to, amendments to maritime safety legislation and regulation put into place by the Government of Canada. The regulatory amendments are discussed in other Project Data Records.

This performance standard has again been updated. The most recent edition is November 2005.

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Fax: (819) 956-5644
URL: http://www.pwgsc.gc.ca/cgsb/home/index-e.html

Record Number: 066

Research Category: TECHNOLOGY

Improvement Reference: Industry Self-Help Aviation Rescue Capability

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 114

Effective Date: June 1989

Title: A Report on Enhancements for Existing and Future Helicopters Supporting Operations of the Canadian Oil and Gas Industry

Author: Survival Systems Limited

Description:

This report details the required and optional enhancements to the offshore service helicopter fleet to permit the aircraft to be upgraded for better reliability, advanced capability and a better survival rate in the event of an inflight emergency.

Elements of improvement that were discussed included: structure, passenger and crew seating, passenger restraints, fuel and fuel systems, over-water operational systems, wire-warning systems and Flight Data Recorder technologies.

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URL: http://www.capp.ca

No Graphic Available

Record Number: 067

Research Category: REGULATION

Improvement Reference: Offshore Occupational Health & Safety Systems

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: Various

Effective Date: 1989

Title: Draft Newfoundland Petroleum Occupational Safety and Health Regulations

Author: Canada-Newfoundland and Labrador Offshore Petroleum Board

Description:

Whereas the regional offshore petroleum Boards were formed, the applicable Atlantic Accord legislation empowered the Board(s) to administer offshore regulation. Mirror legislation across a range of offshore activities was required to be put into place.

The Newfoundland Petroleum Occupational Safety and Health (POSH) regulations took the place of the Canada Oil and Gas Lands "Oil and Gas OSH" regulations and established regulatory requirements for offshore safety, including that of escape, evacuation and rescue approaches and technology.

Contact Information:

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E-mail: Postmaster@cnlopb.nl.ca
URL: http://www.cnlopb.nl.ca

No Graphic Available

Record Number: 068

Research Category: TECHNOLOGY

Improvement Reference: Update Summary of Current Offshore Evacuation Technologies

Area of Impact: International

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: March 1990

Title: Evacuation Technologies Applicable to Offshore Exploration and Development Operations – Phase I Report

Author: The Cord Group Limited

Description:

This report presents a collation of literature search information and manufacturers' contacts regarding the current "state of the art" of global offshore evacuation technologies. The report analyzed evacuation systems into primary, secondary and tertiary categories and identified the approaches being taken in escape, evacuation and rescue in other operationally-mature offshore areas.

The information noted on the evacuation systems placed them in dry, semi-dry and wet categories and identified the operational status of the current technology, system successes/failures, contact information of the developer/manufacturer and whether further research was pending or not envisioned as necessary.

Contact Information:

Canadian Association of Petroleum Producers
Suite 2100, 350 7th Avenue S.W.
Calgary, Alberta, Canada T2P 3N9
Tel: (403) 267-1100
Fax: (403) 261-4622
E-Mail: communication@capp.ca
URL: http://www.capp.ca

Record Number: 069

Research Category: TECHNOLOGY

Improvement Reference: Improvements to Passenger Survivability After Helicopter Ditching and Inversion

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: N / A

Effective Date: May 1990

Title: Emergency Breathing System as an Aid to Egress from a Downed Flooded Helicopter

Author: A. Bohemier; P. Chandler; S. Gill

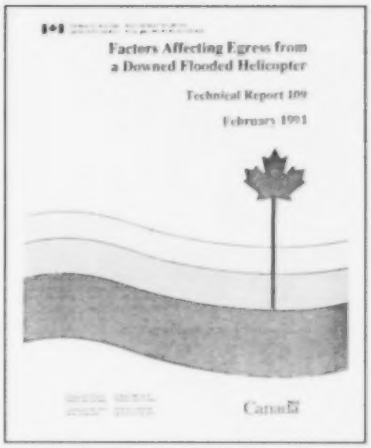
Description:

This report outlines the advantages and potential drawbacks to providing an Emergency Breathing System (EBS) for helicopter passengers in the event of an aircraft inversion after a water landing. Using a METS (Modular Egress Training Simulator), which is a full size helicopter passenger compartment, complete with seats and passenger restraints, that is lowered into the water and inverted, to train offshore workers how to cope with a ditching and inversion at sea, the EBS was tested in a number of situations.

The EBS device may be pressurized or non-pressurized and is available in numerous configurations. The research indicated that there was a definitive advantage in providing one or two breaths of extra air for passengers, to reduce problems of breath-holding during the disorientation training, and in the event of an actual ditching and inversion.

Contact Information:

Natural Resources Canada
(Office of Energy Research and Development)
(Panel on Energy Research and Development)
580 Booth Street, 14th Floor, Section D-2
Ottawa, Ontario Canada K1A 0E4
Tel: (613) 947-3481
Fax: (613) 995-6146
E-Mail: oerd.brde@nrcan.gc.ca
URL: http://www2.nrcan.gc.ca/es/oerd/



Record Number: 070

Research Category: PERSONNEL

Improvement Reference: Factors that Disorient Persons Evacuating an Inverted Helicopter at Sea

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: N / A

Effective Date: February 1991

Title: Factors Affecting Egress from a Downed Flooded Helicopter
COGLA Technical Report 109

Author: A. Bohemier; P. Chandler; S. Gill

Description:

This project is aimed at improving the safety of offshore helicopter operations in support of petroleum exploration and development. The tests were conducted in a Helicopter Underwater Escape Trainer (HUET) in an indoor pool environment. The HUET and properly seated passengers were lowered into the pool and inverted, modeling the natural speed and motions of an actual inverting helicopter. A number of conclusions were reached:

- The lack of a clear visual reference is disorienting to the evacuee
- There is a definite correlation between the incidence of successful egress and the subject's seat position

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(Program for Energy Research and Development)
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URL: http://www2.nrcan.gc.ca/es/oerd/

No Graphic Available

Record Number: 071

Research Category: TECHNOLOGY

Improvement Reference: Innovative Alternate Evacuation Technology

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 107

Effective Date: October 1991

Title: Submersible Escape Capsules for Offshore Oil Rigs

Author: M. J. Hinchey; D. B. Muggeridge

Description:

During severe storms, offshore rig evacuation systems have proven themselves to be inadequate, particularly during deployment away from the stricken installation. The project researched the utility of developing a survival capsule that would sink below the surface. Even during a winter storm, water motions due to storms are insignificant at a wavelength or so below the surface.

This paper reviews the development work on the capsule to date.

Contact Information:

Ocean Engineering and Research Centre
Faculty of Engineering & Applied Science
St. John's, NL, Canada A1B 3X5
Tel: (709) 737-8805
Fax: (709) 737-2116
E-Mail: cdaley@engr.mun.ca
URL: http://www.engr.mun.ca/

No Graphic Available

Record Number: 072

Research Category: PERSONNEL

Improvement Reference: Summary of Safety and Emergency Training Initiatives and Enhancements on the East Coast

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 27 & 46

Effective Date: October 1991

Title: Canadian Offshore Petroleum Industry Industrial Safety Training- Past, Present and Future

Author: Fred C. Leafloor
Paper presented at 3rd International Conference Training for Survival And Rescue at Sea, International Association for Sea Survival Training

Description:

This paper outlines the development of a uniquely Canadian system for personal offshore survival training. The training programs were developed as a direct result of the findings and recommendations of the RCOMD and are implemented throughout Canada's East Coast offshore jurisdictions.

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No Graphic Available

Record Number: 073

Research Category: TECHNOLOGY

Improvement Reference: Seascape Marine Evacuation System

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: October 1991

Title: Emergency Response Scenarios and Means of Evacuation

Author: D. P. O'Brien
Paper presented at 3rd International Conference Training for Survival And Rescue at Sea, International Association for Sea Survival Training

Description:

Discussion of an innovative evacuation technology using a deployment arm and a cradled TEMPSC to ensure a deployment at the sea surface is made at an adequate distance from the stricken MODU.

Contact Information:

Seascape 2000 Incorporated
11 Knowling Street,
St. John's, NL, Canada A1E 2N8
Tel: (709) 737-1562
E-Mail: dobrien@seascape2000.com

No Graphic Available

Record Number: 074

Research Category: STANDARD

Improvement Reference: Discussion of the development and trials conducted to establish a standard for a Marine Anti-Exposure Suit

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 109

Effective Date: October 1991

Title: Development of a Canadian Standard for Marine Anti-Exposure Suit Systems

Author: Paul Potter, The Cord Group Limited
Paper presented at 3rd International Conference Training for Survival And Rescue at Sea, International Association for Sea Survival Training

Description:

Canadian Coast Guard determined that there was a need to develop a standard in Canada for a Marine Anti-Exposure Work Suit System. During the development of this standard, research was necessary to determine thermal criteria and to conduct a comparative study between thermal manikin results and human subject results.

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Transport Canada
Tower C, Place de Ville,
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Ottawa, Ontario, Canada, K1A 0N5
Tel: (613) 990-2309
URL: http://www.tc.gc.ca/marine

Record Number: 075

Research Category: STANDARD

Improvement Reference: Development of a standard for the design, manufacture and testing of lifeboats

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: August 1992

Title: Standards for Lifeboats

Author: Transport Canada

Description:

Document provides a standard for the design, manufacture and testing of lifeboats. The standard provides performance requirements for traditional maritime wooden lifeboats, open lifeboats, Totally Enclosed Motor Propelled Survival Craft (TEMPSC), fiberglass construction lifeboats, single-davit and dual-davit lifeboats and freefall lifeboats.

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URL: http://www.tc.gc.ca/marine

No Graphic Available

Record Number: 076

Research Category: STANDARD

Improvement Reference: Standard for the design, manufacture and testing of launching and embarkation appliances

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: August 1992

Title: Launching and Embarkation Appliances

Author: Transport Canada
Report: TP7323E

Description:

Standards for lifeboat and rescue boat davits and launching devices, liferaft launching appliances, emergency boat launching devices and freefall launching. Approval procedures and conditions.

Contact Information:

Transport Canada
Tower C, Place de Ville,
330 Sparks Street
Ottawa, Ontario, Canada, K1A 0N5
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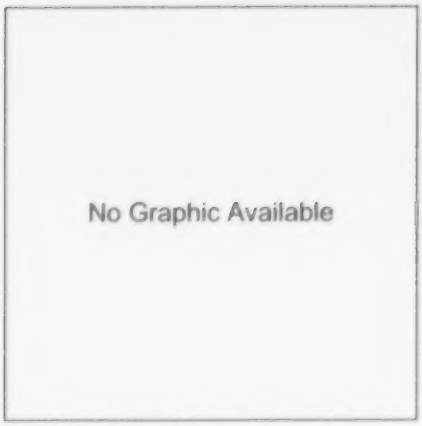
URL: http://www.tc.gc.ca/marine



Record Number: 077

Research Category: REGULATION

Improvement Reference: Establish standards and requirements for safe drilling operations

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 44 & 96

Effective Date: January 1993

Title: Newfoundland Offshore Petroleum Drilling Regulations

Author: Canada-Newfoundland and Labrador Offshore Petroleum Board

Description:

The Drilling Regulations define and specify the required design engineering, operational equipment capabilities and carriage, personnel training and skills and life saving equipment numbers and availability for a Mobile Offshore Drilling Unit. Items such as the requirement for a designated standby vessel, the provision of adequate numbers and types of lifejackets and immersion suits are included within these regulations.

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URL: http://www.cnlopb.nl.ca

Record Number: 078

Research Category: PERSONNEL

Improvement Reference: An Assessment of Critical Human Error Potential During EER

Area of Impact: International

Organization Category: Government

Royal Commission Recommendation: N / A

Effective Date: March 1993

Title: A Human Factors Analysis of Evacuation, Escape and Rescue from Offshore Installations

Author: B. Kennedy

Description:

Previous offshore incidents have shown the importance of individual human actions in determining not only the individual's chance of survival, but also those of the evacuating group. Hence there is a need to identify and anticipate human failures and/or errors during the Escape, Evacuation and Rescue process.

Two major failure areas were identified within this study: *failures of vital command and control actions* and *potential failures made during the abandonment of the installation by TEMPSC.*

Contact Information:

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Lord Cullen House, Fraser Place
Aberdeen, Scotland AB25 3UB
Tel: (44) 1224 252500
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URL: http://www.hse.gov.uk/

No Graphic Available

Record Number: 079

Research Category: TECHNOLOGY

Improvement Reference: Marine Evacuation Systems Research

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: 1993

Title: Recent Developments in Offshore Rig/Platform Evacuation

Journal: Ocean Engineering, Vol. 20, No. 6(1993): 555-567

Author: D.P. O'Brien; M.J. Hinchey; D.B. Muggeridge

Description:

During severe storms, evacuation systems for offshore rigs and platforms currently in use have proven themselves to be inadequate. Typically, during deployment of a lifeboat, it is often damaged to the point of not being seaworthy before it reaches the ocean surface. This is especially the case for cable-launched boats where a pendulum-like motion of the craft on its cables is often set up. It is less of a problem for freefall lifeboats. Even when a craft reaches the ocean surface intact, high winds and waves can drive it back against the rig/platform structure.

This paper describes the state of the art of evacuation. It focuses on two new systems being developed by the authors in Newfoundland.

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No Graphic Available

Record Number: 080

Research Category: REGULATION

Improvement Reference: Establish Structural and Equipment Performance Standards for MODUs

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 80 & 96

Effective Date: February 1995

Title: Newfoundland Offshore Certificate of Fitness Regulations

Author: Canada-Newfoundland and Labrador Offshore Petroleum Board

Description:

The Certificate of Fitness Regulations establish the design, structural, equipment and operational minimum standards for a Mobile Offshore Unit or fixed platform.

The regulations accomplish this goal by establishing internal specific requirements and also referring to other existing regulations, standards and guidelines pertinent to the safe operation of the offshore installation, including the lifesaving equipment requirements and standards and crew experience, training and capability to complete the drilling activity in a safe and environmentally benign manner.

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No Graphic Available

Record Number: 081

Research Category: REGULATION

Improvement Reference: Establish Structural and Equipment Minimum Requirements for Offshore Installations

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 80 & 96

Effective Date: February 1995

Title: Newfoundland Offshore Petroleum Installations Regulations

Author: Canada-Newfoundland and Labrador Offshore Petroleum Board

Description:

The Installations Regulations define and specify the required design engineering, operational equipment capabilities and carriage, personnel training and skills and life saving equipment numbers and availability for a Mobile Offshore Unit or fixed platform, with either type of facility being used in one of four roles:

- Accommodations Installation
- Diving Installation
- Drilling Installation
- Production Installation

Items such as the requirement for and provision of adequate numbers and types of lifejackets and immersion suits are included within these regulations.

Contact Information:

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No Graphic Available

Record Number: 082

Research Category: REGULATION

Improvement Reference: Establish Structural and Equipment Performance Standards for MODUs

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 80 & 96

Effective Date: April 1995

Title: Nova Scotia Certificate of Fitness Regulations

Author: Canada-Nova Scotia Offshore Petroleum Board

Description:

The Certificate of Fitness Regulations establish the design, structural, equipment and operational minimum standards for a Mobile Offshore Unit or fixed platform.

The regulations accomplish this goal by establishing internal specific requirements and also referring to other existing regulations, standards and guidelines pertinent to the safe operation of the offshore installation, including the lifesaving equipment requirements and standards and crew experience, training and capability to complete the drilling activity in a safe and environmentally benign manner.

Contact Information:

Canada - Nova Scotia Offshore Petroleum Board
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Halifax, NS, Canada B3J 3K9
Tel: (902) 422-5588
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No Graphic Available

Record Number: 083

Research Category: REGULATION

Improvement Reference: Regulations respecting safety, conservation and environmental practices for petroleum production

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 80 & 96

Effective Date: April 1995

Title: Nova Scotia Offshore Area Petroleum Production and Conservation Regulations

Author: Canada-Nova Scotia Offshore Petroleum Board

Description:

These regulations identify the required equipment, procedures and practices necessary to promote a safe, environmentally benign operation that will maximize safe operations with due regard for the best principles of management and conservation of the petroleum resource. Elements of the EER process, such as the requirement for standby/rescue boats and lifesaving appliances are portions of these safety requirements.

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No Graphic Available

Record Number: 084

Research Category: REGULATION

Improvement Reference: Establish standards and requirements for safe drilling operations

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 80 & 96

Effective Date: April 1995

Title: Nova Scotia Offshore Petroleum Drilling Regulations

Author: Canada-Nova Scotia Offshore Petroleum Board

Description:

The Drilling Regulations define and specify the required design engineering, operational equipment capabilities and carriage, personnel training and skills and life saving equipment numbers and availability for a Mobile Offshore Drilling Unit. Items such as the requirement for a designated standby vessel, the provision of adequate numbers and types of lifejackets and immersion suits are included within these regulations.

Contact Information:

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No Graphic Available

Record Number: 085

Research Category: REGULATION

Improvement Reference: Establish Structural and Equipment Minimum Requirements for Offshore Installations

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 80 & 96

Effective Date: April 1995

Title: Nova Scotia Offshore Petroleum Installations Regulations

Author: Canada-Nova Scotia Offshore Petroleum Board

Description:

The Installations Regulations define and specify the required design engineering, operational equipment capabilities and carriage, personnel training and skills and life saving equipment numbers and availability for a Mobile Offshore Unit or fixed platform, with either type of facility being used in one of four roles:

- Accommodations Installation
- Diving Installation
- Drilling Installation
- Production Installation

Items such as the requirement for and provision of adequate numbers and types of lifejackets and immersion suits are included within these regulations.

Contact Information:

Canada - Nova Scotia Offshore Petroleum Board
6th Floor Toronto Dominion Centre, 1791 Barrington Street
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Fax: (902) 422-1799
URL: http://www.cnsopb.ns.ca

Record Number: 086

Research Category: STANDARD

Improvement Reference: Establish the structural, operational and equipment requirements for a MODU

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 96

Effective Date: 1995

Title: Standards Respecting Mobile Offshore Drilling Units

Author: Transport Canada

Description:

The "Canadian MODU Code" established the regulatory requirements for the structure of the Mobile Offshore Unit, the operational procedures used, and the equipment fitted or carried, with specific care given to the equipment and procedural options involved in Escape, Evacuation and Rescue. The MODU Code was a bridge between traditional marine requirements similar to those of a standard cargo ship and the specialized requirements of a drilling operation.

The Canadian MODU Code was not formally withdrawn; however, the regional Petroleum Boards are aware that the advances in technology and processes have superseded many of its requirements and the Canadian MODU Code is no longer the primary design and equipment reference applied to MODUs in Canada.

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Transport Canada
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URL: http://www.tc.gc.ca/marine

No Graphic Available

Record Number: 087

Research Category: TECHNOLOGY

Improvement Reference: Floating Production Storage, Offloading System Marine Evacuation Systems

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: November 1997

Title: Design of Escape, Evacuation and Rescue Systems for a FPSO Vessel

Author: P. L. Johnson

Description:

Key factors needed for a successful escape, evacuation and rescue operations strategy are touched upon, followed by fixed installations versus FPSO vessels and layout of escape routes.

Next, an escape study methodology is looked at, including diagrams from computer model, escape phase and 1st phase of evacuation. After this, location, layout and integrity of accommodation (temporary refuge) are touched upon. Successful evacuation is discussed and tables are provided to show results.

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OFFSHORE TECHNOLOGY
REPORT - OTO 97 009

DESIGN, CONSTRUCTION,
COMMISSIONING AND TESTING OF THE
SEASCAPE SYSTEMS LTD.
EMERGENCY EVACUATION SYSTEM

Record Number: 088

Research Category: TECHNOLOGY

Improvement Reference: Seascape Evacuation System Full Scale Trials

Area of Impact: International

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: December 1997

Title: Design, Construction, Commissioning and Testing of the Seascape Systems Ltd., Emergency Evacuation System (Report OTO 97 009)

Author: Health & Safety Executive, U.K. (and contributing organizations in the U.K. and Canada)

Description:

This report covers the activities carried out during design, construction, commissioning, testing and demonstration of the prototype Seascape TEMPSC launching system. These activities include the design and construction of the arm, tower, and TEMPSC lifting yoke, the design and construction of the winch, and the development of the commissioning and testing procedures. The prototype system's successful trials showed that the Seascape concept has important safety and operational advantages, including possible savings in maintenance levels, when compared to other alternative TEMPSC launching systems.

It was concluded that the system has proved that it offers offshore operators a safer and more reliable option to conventional davit launched systems and that it fulfills the recommendations of the Cullen Report as regards to improving the performance of evacuation systems.

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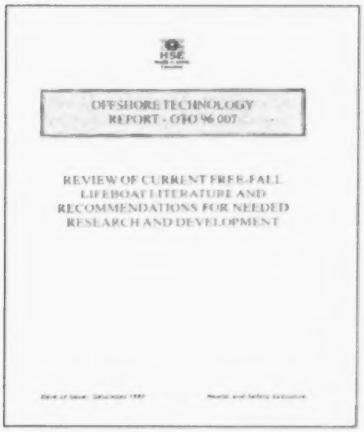
URL: http://www.hse.gov.uk/


OFFSHORE TECHNOLOGY REPORT - OTO 96 007

REVIEW OF CURRENT FREE-FALL LIFEBOAT LITERATURE AND RECOMMENDATIONS FOR NEEDED RESEARCH AND DEVELOPMENT

Record Number: 089

Research Category: TECHNOLOGY

Improvement Reference: Freefall Lifeboat Technology Study – What Has Been Done?

Area of Impact: International

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: December 1997

Title: Review of Current Free-Fall Lifeboat Literature and Recommendations for Needed Research and Development (Report OTO 96 007)

Author: Health & Safety Executive, U.K. (and contributing organizations in the U.K. and Canada)

Description:

The purpose of the study was to determine the research that has been conducted which is applicable to free-fall launches conducted from floating and fixed offshore platforms, to determine the research that needs to be conducted, and to evaluate criteria for assessing the performance of free-fall lifeboats launched from platforms.

As a result of this study, several topics for research and development have become evident. These topics include: determination of forces acting during a launch, evaluation of performance in a wind and wave environment, maintenance and other issues.

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URL: http://www.hse.gov.uk/

Record Number: 090

Research Category: TECHNOLOGY

Improvement Reference: Lifeboat Occupant Recovery System (LORS) Full Scale Trials

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 47

Effective Date: 1997

Title: LORS: Lifeboat Occupant Recovery System 22-Person TEMPSC Offshore Sea Trials, Moderate Sea States (Phase 2) 1986-1987

Author: U.K. Health and Safety Executive (Report: OTO 96 706)

Description:

The Lifeboat Occupant Recovery System is designed to provide an intermediate rescue capability for vessels presently unable to recover a lifeboat directly from the sea. This concept has completed two successful phases of development (Phase 1 in light sea states and Phase 2 in moderate sea states). The need for such a system was in part due to the failures and fatalities that had occurred in transferring crew from the TEMPSC or in towing the TEMPSC, in part due to the increased environmental limits conditions in which the TEMPSC could be launched following the development of systems such as PrOD.

The LORS concept is fairly simple. It provides for a remote connection of a towline from rescue vessel to the lifeboat, a method to draw the lifeboat, under control, into a stabilizing connection attached to the rescue vessel, and options for the direct transfer of the survivors to the safety of the vessel's deck. It was concluded that the LORS system would increase the likelihood of a successful evacuation from an offshore installation.

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No Graphic Available

Record Number: 091

Research Category: REGULATION

Improvement Reference: Regulations Regarding the training and licensing of marine personnel on MOUs

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 26, 27, 113

Effective Date: 1997

Title: Marine Certification Regulations

Author: Transport Canada

Description:

In compliance with the appropriate Conventions of the International Maritime Organization (IMO), Canada as a Flag State was required to draft legislation and regulation to give force to the provisions of the Standard for the Certification and Training of Watchkeepers (STCW). These provisions included establishing the training regimen for certificated watchkeepers, establishing the type of certificates that corresponded to the requirements of STCW and, in particular, expanding the list of traditional shipping Certificates of Competency to include Certificates of Competence for MOU marine-service positions, such as Offshore Installation Manager, Watchkeeping Mate-MODU, and Barge Supervisor. These requirements are within the *Marine Certification Regulations*.

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No Graphic Available

Record Number: 092

Research Category: REGULATION

Improvement Reference: Establish Requirement for Offshore Facilities to Carry Licensed Crew

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 26 & 113

Effective Date: 1997

Title: Crewing Regulations

Author: Transport Canada

Description:

These regulations stipulate the type and number of certificated personnel required to safely crew Canadian ships and offshore facilities, and define certain elements of the crew's emergency duties (particularly with regard to EER). In compliance with the appropriate Conventions of the International Maritime Organization (IMO), Canada as a Flag State was required to draft legislation and regulation to give force to the IMO provisions regarding Safe Manning. These provisions included establishing the minimum manning of ships and offshore facilities and expanding the list of traditional shipping licensed positions to include MODU marine-service positions, such as Offshore Installation Manager, Watchkeeping Mate-MODU, and Barge Supervisor. The *Crewing Regulations* work in conjunction with the *Marine Certification Regulations*.

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No Graphic Available

Record Number: 093

Research Category: STANDARD

Improvement Reference: Establish Minimum Standard of Skill and Competence in Emergency Duties

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 47 & 113

Effective Date: 1998

Title: Marine Emergency Duties Training Program (TP 4957)

Author: Transport Canada

Description:

The Marine Emergency Duties Program (in its modern iteration) has been in force since the 1970s. In response to the loss of the *Ocean Ranger* and crew, a new focus was established regarding the type and intensity of training provided, and the modernization of the EER equipment taught within the program.

Also, immediately after the loss, the modernized Marine Emergency Duties (MED) Program application was extended by regulation to offshore installations and facilities in the absence of any other available personal survival training. MED training for the offshore industry has now been superseded by industry-focused personal survival and marine emergency response training (Basic Survival Training), but MED still applies to the marine crew of Mobile Offshore Units and to all support and standby/rescue vessels. The current version of the MED program was established September 1998.

Contact Information:

Transport Canada
Tower C, Place de Ville,
330 Sparks Street
Ottawa, Ontario, Canada, K1A 0N5
Tel: (613) 990-2309
URL: http://www.tc.gc.ca/marine

Performance-Based Ergonomic
Criteria and Evaluation Standards for
Offshore Rig Evacuation Systems, Phase 1
Prepared for Transportation Development Centre
Transport Canada
by Turpin Consultants
for Consulting and Audit Canada

Record Number: 094

Research Category: PERSONNEL

Improvement Reference: Evaluation Standards for Offshore Rig Evacuation Systems TP 13454E

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: August 1999

Title: Performance Based Ergonomic Criteria and Evaluation Standards for Offshore Rig Evacuation Systems: Phase 1

Author: Betty Ann M. Turpin, Turpin Consultants

Description:

Study focused on the development of performance based ergonomic criteria to evaluate semi-wet evacuation systems used on offshore rigs. The ergonomic factors were categorized under the following areas: management, training, procedures, information and communication and environmental factors.

A table was developed that identified the relevant ergonomic factors for each evacuation stage, appropriate references, information still required and performance based criteria against which evacuation systems could be evaluated.

Recommendations addressed the need for a comprehensive review and analysis of ergonomic requirements for evacuation systems.

Sponsoring Agency: Transportation Development Centre

Contact Information:

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800 René Lévesque Blvd. West, Suite 600
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Tel: (514) 283-0000
Fax: (514) 283-7158
E-mail: tdccdt@tc.gc.ca
URL: www.tc.gc.ca/tdc

Record Number: 095

Research Category: STANDARD

Improvement Reference: Update to Performance Standards for Marine Immersion Suits

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 109

Effective Date: December 1999

Title: Marine Abandonment Immersion Suit Systems (65-16.M99)

Author: Canadian General Standards Board

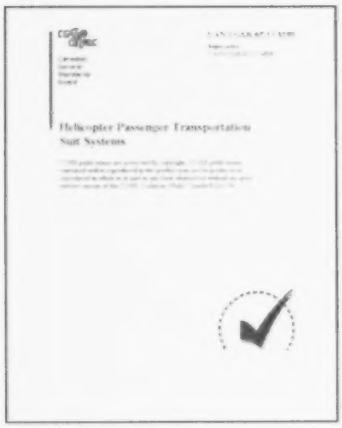
Description:

This revision of the Marine Abandonment Immersion Suit standard included the implementation of enhanced design elements developed as a result of research into the EER process, specifically with regard to marine survival. These standards stipulate the requirements incumbent upon designers and manufacturers of the product, but the technical performance standards do not establish requirements for carriage.

This standard is updated regularly as technological improvements are developed. The current version of this standard is Immersion Suit Systems CAN/CGSB 65.16-2005, published in December 2005.

Contact Information:

Canadian General Standards Board
Place du Portage Phase III, 6B1
11 Laurier Street
Gatineau, Quebec, Canada, K1A 1G6
Tel: (819) 956-0425 *or* 1-800-665-2472
Fax: (819) 956-5644
URL: http://www.pwgsc.gc.ca/cgsb/home/index-e.html



Record Number: 096

Research Category: STANDARD

Improvement Reference: Helicopter Passenger Transportation Suit Improvements

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 109

Effective Date: December 1999

Title: Helicopter Passenger Transportation Suit Systems

Author: Canadian General Standards Board

Description:

This version of the standard supersedes the 1988 initial release of the standard. In this version, research has improved the thermal protective capabilities, the type of materials available, flotation characteristics, and has moved closer to the "dual-role" immersion suit concept for offshore use, under certain conditions.

Contact Information:

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11 Laurier Street
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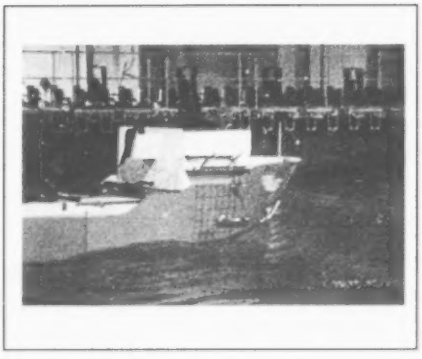
Fax: (819) 956-5644
URL: http://www.pwgsc.gc.ca/cgsb/home/index-e.html



Record Number: 097

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Modeling Trials Report

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: November 2000

Title: Lifeboat Evacuation Performance in a Range of Environmental Conditions
Paper presented at the Major Hazards Offshore Conference, 2000, London

Author: A.J. Simões Ré; Brian J. Veitch
NRCC, Institute for Marine Dynamics

Description:

The paper is concerned with the evaluation of lifeboat evacuation as a function of environmental conditions. Scale model experiments were done of lifeboat evacuation from a floating petroleum installation. This was the first phase of an experimental program that aims to provide objective, reliable data to designers, regulators and other decision-makers. The experiments are described and some test results are presented and discussed.

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Web site: www.engr.mun.ca/OERC

No Graphic Available

Record Number: 098

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Modeling Trials

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: March 2000

Title: Performance Evaluation of Offshore Evacuation Systems

Author: Jason Dawe, Institute for Marine Dynamics

Description:

This report deals with the performance evaluation and ranking of one particular offshore evacuation system, the conventional twin fall davit deployment system. The davit system is used to deploy a conventional Totally Enclosed Motor Propelled Survival Craft, or TEMPSC, from a generic FPSO model. The experiments were conducted at the Institute for Marine Dynamics (IMD), in St. John's, in the Ocean Engineering Basin.

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URL(s): http://www.nrc-cnrc.gc.ca/institutes/iot_e.html
www.nrc-cnrc.gc.ca/institutes/iot_e.html

Record Number: 099

Research Category: TECHNOLOGY

Improvement Reference: Development of an Escape, Evacuation & Rescue Computer Simulation Software

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: June 2001

Title: Escape, Evacuation, and Rescue Research Project

Author: F. G. Bercha

Description:

This report describes the Escape, Evacuation, and Rescue (EER) research and development program leading to the implementation of performance-based EER standards for the Canadian East Coast offshore oil and gas industry. The principal tasks of the work were the following:

- Worldwide data and literature compilation and review.
- Development of a computerized EER simulator, the Risk and Performance Tool (RPT).
- Human factors experiments for essential RPT inputs.
- Application of the RPT to specific case studies.
- Program for the development of performance-based EER standards.

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Fax: (403) 270-2014
E-Mail: bgroup@berchagroup.com
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No Graphic Available

Record Number: 100

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Research Discussion Paper

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: August 2001

Title: Arctic Offshore Escape, Evacuation & Rescue Systems

Author: F.G. Bercha; M. Cerovsek
Paper presented at 16th International Conference on Port and Ocean Engineering Under Arctic Conditions, Ottawa

Description:

A reliable and effective escape, evacuation, and rescue (EER) system and procedures will have an important impact on the safety of passengers and crew of any vessel or installation which has an accident at sea.

Although EER is well developed for open water vessels and installations, only a limited amount of attention has been directed at EER in ice covered waters. In this paper, following a review of the problems and available technology for both vessel and platform EER under Arctic conditions, a description of possible technological and procedural solutions and the results of their reliability analysis through simulation are given.

Solutions include novel launch and capsule adaptations to perform safely in a range of ice conditions as well as open water. Simulation of each component of the Arctic EER process as well as reliability evaluation of the process itself for combinations of different evacuation and rescue modes for different vessels and installations for a range of representative ice conditions was made. A description of full-scale empirical quantification of human performance parameters for the escape and evacuation module of the model is included. The expanded methodology and its empirical and theoretical foundations and results of the reliability analysis for different Arctic EER scenarios are new.

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No Graphic Available

Record Number: 101

Research Category: COMMUNICATION

Improvement Reference: Development of an "Ocean Technology Cluster" (Fiscal Information)

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: October 2001

Title: Offshore Safety Research Expanding

Journal: Memorial University Gazette, October 18, 2001

Description:

Minister of Industry announces the investment of $20 million to be used for the development of an ocean technology cluster in Newfoundland.

The funding will allow the NRC to significantly expand research and technology-driven initiatives at their Institute for Marine Dynamics (IMD) in St. John's. Research projects that are ongoing at the IMD have already begun to see the benefits of this announcement. The research is in the area of offshore safety, specifically offshore escape, evacuation and rescue. The two main aims of the work are to evaluate lifeboat evacuation capabilities as a function of weather conditions, and to develop performance measures that have practical utility for new regulations.

These goals were arrived at through consultation with many stakeholders, including the Canada-Newfoundland Offshore Petroleum Board. Ultimately, the project aims to provide information and knowledge so that people making decisions can make better, more informed choices. The work being done is moving the project beyond simply providing information, to making significant improvements in evacuation procedures.

With funding from the NRC, the province's Offshore Development Fund, the Atlantic Canada Petroleum Institute, Canadian Association of Petroleum Producers, Transport Canada, and Natural Resources Canada, this research project will have a major impact on the way people make safety decisions in the offshore industry worldwide.

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No Graphic Available

Record Number: 102

Research Category: TECHNOLOGY

Improvement Reference: Research Into Arctic EER (Ice/Water Interface)

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 107

Effective Date: 2001

Title: Emergency Evacuation from Ships and Offshore Structures and Survivability in Ice-Covered Waters: Current Status and Development

Author: J. Cremers; S. Morris

Description:

In this paper, the escape, evacuation and rescue process for Arctic and polar water conditions is discussed. It is shown by numerical simulation of this process that the rescue success rate decreases compared with the 'open sea' water case and is also strongly dependent on the weather conditions. This is mainly because the evacuation process and, to some extent, the rescue process face additional difficulties. The current regulations are analysed with respect to Arctic conditions and suggestions for their implementation are given. The recommendations include a more suitable temperature range for working materials, a suitable lifeboat type and improvements for the lifeboat propulsion and equipment. The application of remote sensing techniques to optimise the search process is discussed.

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Record Number: 103

Research Category: PROCEDURES

Improvement Reference: Rescue by Designated Standby/ Rescue Vessels

Area of Impact: International

Organization Category: Government

Royal Commission Recommendation: 46, 47, 48

Effective Date: 2001

Title: Marine Offshore Rescue Advisory Group – Good Practice in Offshore Rescue

Author: Health and Safety Executive / MaTSU, UK

Description:

This study presents a very detailed discussion of the characteristics of standby/ rescue ships and the capability they represent to rescue persons from the sea. The study discussed:

- Overview of typical characteristics of standby vessels
- Launch, operation, and recovery of the fast rescue (daughter) craft
- Equipment available to the rescue craft personnel (personal protection and survivor recovery)
- Location, care and transfer of the casualties
- Human Factors issues regarding the rescuers
- Training (one of the Human Factors)

Contact Information:

Health and Safety Executive
Hazardous Installations Directorate, Offshore Division
Lord Cullen House, Fraser Place
Aberdeen, Scotland AB25 3UB
Tel: (44) 1224 252500
Fax: (44) 1224 252615
URL: http://www.hse.gov.uk/

No Graphic Available

Record Number: 104

Research Category: PERSONNEL

Improvement Reference: Effects on Body Mechanics Due to Wearing an Emergency "Survival Suit"

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 109

Effective Date: 2001

Title: An Anthropometric Survey and Human Factors Study of Offshore Workers For Application to Emergency Survival Suits

Authors: Dr. John McCabe; Dr. John Kozey; Dr. Chris Brooks, Survival Systems
(funding support by Petroleum Research Atlantic Canada – PRAC)

Description:

This project was designed to address a number of important Human Factor issues identified at the Research and Development workshops sponsored by the Atlantic Canada Petroleum Institute and the Canadian Association of Petroleum Producers in March 2000.

The study addresses issues related to the anthropometric dimensions important in the design and use of survival suits and the influence of the suits on the performance of functional tasks during EER.

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Petroleum Research Atlantic Canada
1321 Edward Street
Halifax, NS, Canada B3H 3H5
Tel: (902) 494-2960
Fax: (902) 494-2489
E-Mail: communications@pr-ac.ca
URL: http://www.pr-ac.ca

No Graphic Available

Record Number: 105

Research Category: TECHNOLOGY

Improvement Reference: Summary Overview of EER System Development Process

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 22 & 107

Effective Date: 2001

Title: Escape, Evacuation and Rescue Project: Offshore Evacuation Systems Performance

Author: A.J. Simões Ré

Description:

The project goals were to develop a research program addressing:

- a "fit for purpose" approach to the evaluation of evacuation systems as a function of weather conditions and the effects of weather configurations
- the establishment of "performance standards" in order for the stakeholders to have a common basis upon which to make decisions based upon what was fit-for-purpose

A multi-phased approach was recommended, moving from concept, to model trials, to full scale proof-of-concept sea trials in a range of weather conditions and platform configurations.

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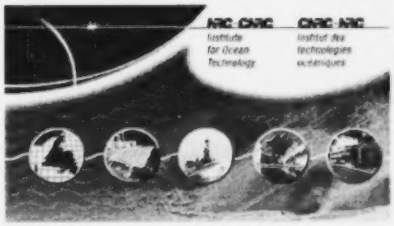

Record Number: 106

Research Category: TECHNOLOGY

Improvement Reference: Model Trials of Offshore Marine Evacuation Systems

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: 2001

Title: Lifeboat Evacuation Systems: Experimental Apparatus and Data Analysis

Author: Timothy A. Wetzel
NRC, Institute for Marine Dynamics

Description:

An Escape, Evacuation and Rescue project evaluating the performance of marine evacuation systems, including the Terra Nova FPSO and a model offshore jacket structure.

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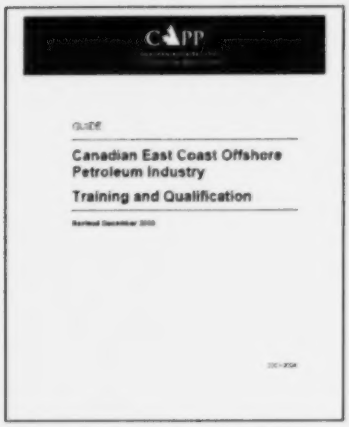

Record Number: 107

Research Category: PERSONNEL

Improvement Reference: Establishment of East Coast Offshore Personnel Training Requirements

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 27, 42, 113

Effective Date: February 2002

Title: Canadian East Coast Offshore Petroleum Industry – Training and Qualification Guidelines

Author: Canadian Association of Petroleum Producers

Description:

The lack of adequate training in a number of subjects was found by the RCOMD as a direct contributor to the causes of the loss of the *Ocean Ranger* and crew.

The original version of the Training and Qualifications Guideline (TQG) was issued in 1988 as the Qualifications, Safety Training and Certification (QSTC) Manual. Currently, both industry and government sit on the TQG Steering Committee to discuss and establish policy and technical requirements for training for offshore personnel (and critical onshore personnel as well).

The most recently released version of the TQG (December 2003 – pictured above) deals with the marine and industrial crews of drilling installations, production installations, and the marine crew of the standby/ supply vessels.

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Evolution of Training for the Maritime Oil and Gas Sector on the Canadian East Coast

By

Anthony Patterson M.M.
Director
Centre for Marine Simulation
Fisheries and Marine Institute of Memorial University of Newfoundland
P.O. Box 4920
St. John's, Newfoundland, Canada
A1C 5R3

Presented at

Canada-Brazil Health, Safety and Environment Seminar and Workshop
Rio de Janeiro, Brazil
March 11-12, 2002

Record Number: 108

Research Category: PROCEDURES

Improvement Reference: Review of Offshore Training Practices

Area of Impact: Canada

Organization Category: University

Royal Commission Recommendation: Various

Effective Date: March 2002

Title: Evolution of Training for the Maritime Oil and Gas Sector on the Canadian East Coast

Author: Anthony Patterson M.M., Fisheries and Marine Institute of Memorial University Presented at Canada-Brazil Health, Safety and Environment Seminar and Workshop

Description:

This paper reviews the immediate impact of the loss of the *Ocean Ranger* on HSE training in Eastern Canada, the process that has been developed to identify and implement new programs. It identifies the types of Health, Safety and Environment training programs developed, provides an overview of the investment made in training infrastructure and forecasts possible future directions in HSE related training in Canada.

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Fax: (709) 737-4569
URL: www.mun.ca

Record Number: 109

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Full Scale Trials

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: April 2002

Title: Innovative Life Rescue Craft Will Soon Become a Reality

Journal: Atlantic Oil and Gas Works, Vol. 11, No. 2 (April 2002): 26-27

Description:

After 20 years of research and development, a state-of-the-art life rescue craft was developed that will give offshore oil rig workers a chance for survival in the icy waters of the Atlantic Ocean. The development of the craft was borne out of the recommendations of the Ocean Ranger Royal Commission.

The life rescue craft measures just over 42 feet in length and is 12 feet wide. Built in Bay Bulls, Newfoundland, the vessel is made of aluminum and powered by twin 150 turbo diesel engines. It has a range of 300 kilometres and can accommodate 70 people. With a full load, the craft weighs just over 17 tons.

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Record Number: 110

Research Category: PROCEDURES

Improvement Reference: International SAR Agreements

Area of Impact: International

Organization Category: Government

Royal Commission Recommendation: 50 & 80

Effective Date: April 2002

Title: International SAR Agreements

Journal: The SAR Watch – USCG Office of Search and Rescue, Issue 5, April 2002

Description:

This USCG newsletter updates a neighbouring Government's current success in establishing international SAR agreements, including with Canada.

SAR agreements between countries or between SAR authorities of countries help establish a basis for working relationships, define SAR regions, provide for territorial entry for SAR, etc. and, because of the humanitarian nature of SAR, they are often favoured by the State department, DOD and others as door-openers for engagement on non-SAR matters.

The National SAR Plan and National SAR Supplement discuss agreements, the SAR Convention calls for them, and the Coast Guard Addendum defines who may negotiate them. The USCG has Agreements with Russia, Canada, Mexico, and others…even China (resulted from the sinking of the Drill Rig OCEAN RANGER, and difficulties they had many years ago handling logistics support via China for the SAR response in the South China Sea).

The USCG is beginning work now on agreements with the Bahamas and Dominican Republic as part of comprehensive efforts to coordinate Coast Guard missions with those countries, and hope to conclude a special one with Canada soon regarding responsibilities for Canadian flag petroleum platforms in Canada's Exclusive Economic Zone, but in a U.S. SAR region. They usually try to cover both maritime and aeronautical SAR in these agreements since the Coast Guard is responsible for both missions in ocean areas.

Contact Information:

Coast Guard Headquarters
Commandant, U.S. Coast Guard,
2100 Second Street, SW,
Washington, DC 20593

US Coast Guard Office of Search and Rescue (Newsletter)
URL: http://www.uscg.mil/hq/g-o/g-opr/newsletter/newsletter.htm

No Graphic Available

Record Number: 111

Research Category: TECHNOLOGY

Improvement Reference: Model Tests: Twin-Fall Davit Lifeboat Launch System

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 22 & 107

Effective Date: May 2002

Title: Safe Evacuation from Offshore Petroleum Installations

Author: R. Woolgar; A. Simões Ré; B. Veitch; D. Pelley

Description:

Marine evacuation systems used on offshore petroleum installations have been investigated using a series of model experiments in a large test facility. The performance of a conventional twin-fall davit launched lifeboat system was evaluated during launching, clearing, and sail-away phases of the evacuation process from a bottom fixed installation.

Performance was examined as a function of weather conditions, from calm water up to Beaufort 8. Based on the results, some guidance is given concerning the rational design of evacuation system configuration

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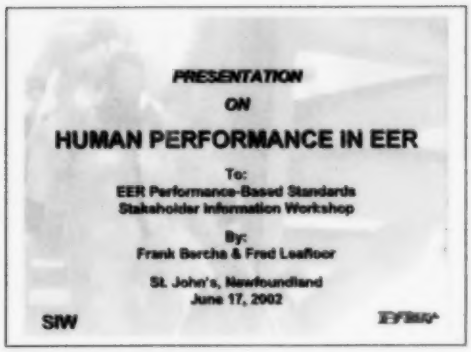

Record Number: 112

Research Category: PERSONNEL

Improvement Reference: Human Error Potential in Emergencies

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: N / A

Effective Date: June 2002

Title: Presentation on Human Performance in EER

Authors: F. G. Bercha; F. C. Leafloor

Description:

As part of the larger study into Escape, Evacuation and Rescue, this discussion on the effect of human decision making in emergency situations indicates that human error potential has a large impact on the success of EER process.

Sampling a number of onshore and offshore major accidents, it is shown that there is a pattern of decision making errors, increasing with the greater complexity of the emergency situation that faces the decision maker. Under certain conditions of longer-term stress-loading, the cognitive processes recover some analytical capability and the decision error potential stabilizes, albeit at a lower level than during a non-stress situation.

Humans can make a difference in the EER process.

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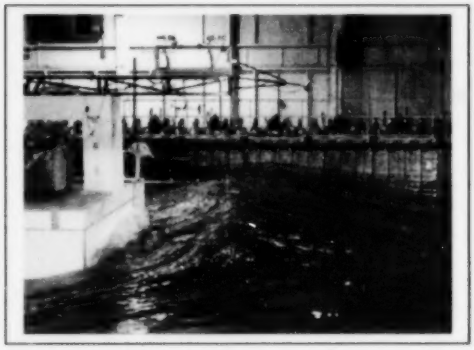

Record Number: 113

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Modeling Trials

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22

Effective Date: 2002

Title: Evacuation by Lifeboat in Extreme Seas

Author: D. Pelley; A. J. Simões Ré; B. J. Veitch
NRCC, Institute for Marine Dynamics

Description:

The performance of marine evacuation systems deployed on offshore structures is investigated using model experiments in the Offshore Engineering Basin at the Institute for Marine Dynamics. The main test program consisted of an evaluation of the conventional twin-fall davit launched lifeboat system. Its performance during launching, clearing, and sail away phases of the evacuation process from a fixed installation was examined as a function of weather conditions. Tests were done in a range of sea states, from calm conditions up to an equivalent of Beaufort Scale 9.

Experimental results are presented and discussed in terms of the measured performance of the lifeboat and evacuation system.

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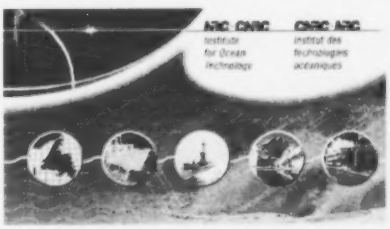

Record Number: 114

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Modeling Trials

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 &107

Effective Date: 2002

Title: Evacuation by TEMPSC

Author: A.J. Simões Ré; B.J. Veitch
NRCC, Institute for Marine Dynamics

Description:

The evacuation system considered is the twin-fall davit launched TEMPSC lifeboat system. Using a general statement of the goal of an evacuation system, several performance measures are proposed along with a conceptual framework of the evacuation zone. These are used to interpret results of model scale experiments to assess the capabilities of evacuation systems and to investigate the influence of weather, system configuration and other factors that may act on those capabilities.

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URL: http://www.nrc-cnrc.gc.ca/institutes/iot_e.html

Record Number: 115

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Modeling Trials

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 & 107

Effective Date: 2002

Title: Systematic Investigation of Lifeboat Evacuation Performance

Author: A.J. Simões Ré; B.J. Veitch; D. Pelley
NRCC, Institute for Marine Dynamics

Description:

The capabilities of marine evacuation systems deployed on offshore structure are investigated using a systematic series of model experiments. Comprehensive results are presented and discussed in the context of design, operations, and regulatory considerations.

The main test program consisted of an evaluation of the conventional twin-fall davit launched lifeboat system. Its performance during launching, clearing, and sail-away phases of the evacuation process from a fixed installation were examined as a function of weather conditions. Weather is shown to have important effects on performance, as are clearance and orientation.

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Record Number: 116

Research Category: TECHNOLOGY

Improvement Reference: TEMPSC Evacuation Systems Launching Study

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 22

Effective Date: 2002

Title: FPSO Evacuation System Performance in a Range of Environmental Conditions (TP 13825E)

Author: A.J. Simões Ré; B.J. Veitch; M. Sullivan; D.B. Colbourne

Description:

This report describes the results of a physical model study aimed at establishing a baseline performance profile of lifeboat evacuation capability as a function of environmental conditions. The main objectives of the study were to evaluate the evacuation capabilities of a totally enclosed motor propelled survival craft (TEMPSC) as a function of weather conditions.

The evacuation experiments were performed from a model Floating Production Storage and Offloading (FPSO) vessel at the Institute for Marine Dynamics. Twin-falls davit deployment from the FPSO was tested in six different environmental conditions. Additional experiments were conducted for the modified evacuation system fitted with a flexible boom.

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FINAL DRAFT

Transportation Development Centre

Montreal
Canada

February 10, 2003

Record Number: 117

Research Category: STANDARD

Improvement Reference: Evacuation Systems Performance Based Standards

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22 &107

Effective Date: February 2003

Title: Canadian Offshore Petroleum Installations Escape, Evacuation and Rescue (EER) Performance Based Standards (PBS): Final Draft

Author: Bercha Engineering (Report: P2101.08)
Transportation Development Centre

Description:

Under this project is the development of performance-based standards (PBS) for escape, evacuation, and rescue (EER) for East coast offshore oil and gas installations together with the supporting research. The PBS development program is carried out under the guidance of a steering committee comprising Transport Canada, Transportation Development Centre, Canada-Nova Scotia Offshore Petroleum Board, Canada-Newfoundland Offshore Petroleum Board, Canadian Association of Petroleum Producers, and other experts. Since experimental data are not available nor can be generated for performance under life threatening conditions, a compendium of all accident anecdotal data, applicable error rate and performance human factors data, and risk and reliability documentation is assembled, reviewed, and transformed into parameters applicable to the operation of the computerized EER probabilistic simulator. In the second subproject, specifically, the Seascape 2000 proprietary system and the PrOD or Preferred Orientation and Deployment lifeboat launch system are evaluated.

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Escape, Evacuation, and Rescue Research Project
Phase II

Prepared for
Transportation Development Centre
Transport Canada

by
BERCHA
Bercha Engineering Limited

April 2003

Record Number: 118

Research Category: STANDARD

Improvement Reference: Evaluation Standards for Offshore Rig Evacuation Systems TP 14091E

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: April 2003

Title: Escape, Evacuation and Rescue Research Project: Phase II

Author: Bercha Engineering Limited
Transportation Development Centre

Description:

This report describes Phase II of the research and development program leading to the implementation of EER performance based standards for East Coast offshore oil and gas installations.

Effects on human performance of psychological and physiological stressors, resulting from extreme conditions, were evaluated and methods of quantifying them for incorporation into the RPT were developed. The RPT was applied to the reliability analysis of the PrOD system, with results including the distribution of contributions of human and mechanical factors to evacuation performance. Version 4.0 of the RPT includes extended options for reliability and availability analysis, human factors, and can output multiple generations of the data analysis. Finally, the development of the PBS was advanced, through numerous draft revisions, from an initial draft to a final draft ready for implementation through the facilitation of, and participation in, a multi-disciplinary process involving technical experts, administrators and stakeholders.

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Record Number: 119

Research Category: STANDARD

Improvement Reference: Marine Evacuation Systems Performance Standards

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: May 2003

Title: Development of Canadian Performance Based EER Standards

Author: F. G. Bercha; E. Radloff; W. Abel

Description:

The Canadian government, through the federal Transportation Development Centre (TDC), in 1999 initiated a program to develop performance-based escape, evacuation, and rescue (EER) standards for offshore installations in Canadian waters.

This paper describes the standards, their development program and the associated research projects needed to fill relevant data gaps. The PBS development program includes approaches to drafting of the Standards, composition of the Task Force, composition of the Steering Committee, regulatory review procedures, stakeholder consultations, and the plan for future implementation of the Standards.

The research program included physical model tests, full-scale equipment and human performance tests, data collection and analysis from the tests and other sources world-wide, and development of a probabilistic computer model, the EER Risk and Profile Tool (RPT) capable of simulating components of, as well as the entire, EER process.

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Record Number: 120

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Full Scale Testing

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: October 2003

Title: Seascape Life-Rescue Craft Undergoes Offshore Testing

Journal: Safety at Sea International, No. 416, October 2003, pp 12-14

Description:

The Seascape Life-Rescue Craft, as now configured, is approximately 12.8 meters long, with a width of 3.6 meters. It is constructed in aluminum and powered by twin150 turbo diesel engines, giving a range of 300 kilometers and a maximum speed of 10.5 knots for 24 hours. It is large enough to seat 70 people in immersion suits.

The craft has already demonstrated its ability to cope with ice conditions. The first ice tests were carried out in Arctic pack ice, and the second ice tests were performed in harbour/sheet ice. The LRC has functioned in ice up to 4.25 meters thick.

The LRC has also been trialed in 60 knot winds, with 10 meter seas.

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Record Number: 121

Research Category: TECHNOLOGY

Improvement Reference: Data Acquisition from Full Scale PrOD Launch System Trials

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 107

Effective Date: 2003

Title: Full Scale Trials of Lifeboat Evacuation Systems

Author: Jim Boone, Institute for Ocean Technology

Description:

This report describes the development and use of a data acquisition system to capture deployment and maneuvering performance data from full-scale twin-fall davit-launched lifeboats for the purpose of correlation with model-scale experimental results.

Full-scale trials were performed at the Fisheries and Marine Institute of Memorial University, Offshore Safety and Survival Centre, during September 2002.

This training facility's conventional twin-fall davit launch system, equipped with a Preferred Orientation and Displacement (PrOD) boom, was used to deploy a Totally Enclosed Motor Propelled Survival Craft (TEMPSC) from a fixed platform in calm conditions.

Data was collected during TEMPSC deployment and operation in each of several lifeboat and launch system configurations.

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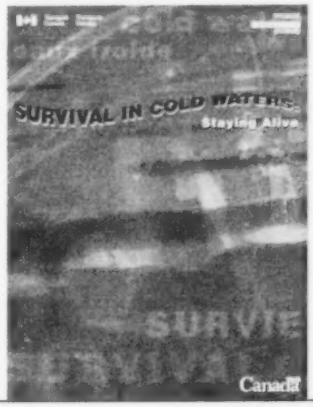

Record Number: 122

Research Category: STANDARD

Improvement Reference: Study of Abandonment / Immersion Suits

Area of Impact: Canada

Organization Category: Transport Canada

Royal Commission Recommendation: 109

Effective Date: January 2003

Title: Survival in Cold Waters: Staying Alive (TP 13822E)

Author: Dr. C. J. Brooks, Survival Systems

Description:

This standard covers the following topics:

- Physiology of immersion
- Key issues in design and testing of immersion suits
- Key issues in construction of immersion suits
- Relationship between immersion suit and lifejacket
- Regulations required

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No Graphic Available

Record Number: 123

Research Category: TECHNOLOGY

Improvement Reference: Innovative Marine Evacuation System

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: 2003

Title: Development of the Seascape II System for Evacuation from Offshore Installations by Lifeboat

Author: Health and Safety Executive, UK

Description:

Offshore support vessels can operate in precarious environmental conditions at offshore installations. Uncontrolled motion of a suspended load can present a hazard and there would be possible risk of injury to personnel as well as the cause of serious damage to the vessel or its associated equipment. These uncontrolled motions are often critical in limiting offshore lifting operations. Various, relatively crude methods are used to stabilize the load. Such methods might involve the attachment of trailing lines and tugger lines. More recently, passive systems such as dampers have been used, but there has been no really satisfactory solution.

The project objectives were:

- To undertake a detailed description of work already undertaken on the Active Pendulation Control System through academic/industrial partnership.
- To consider the robustness of the current technology and the existing equipment set against: maritime workplace / environmental conditions / corporate constraint / offshore support industry requirements / working practices / human behaviour
- To consider and develop ideas as to the suitability of this technology for various known practical applications reliant on lifting operations in a dynamic condition, where there may be currently severe shortfalls in operability and thus availability.

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No Graphic Available

Record Number: 124

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems Model Trials

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 22

Effective Date: 2003

Title: Systematic Experimental Evaluation of Lifeboat Evacuation Performance In a Range of Environmental Conditions: Phase 2

Author: A.J. Simões Ré

Report: TR-2003-02

Org: Memorial University of Newfoundland; Mad Rock Marine Solutions; Transportation Development Centre; Institute for Ocean Technology

Description:

This report describes a systematic study aimed at establishing the capabilities of evacuation systems installed on offshore structures as a function of environmental conditions, installation conditions, and load capacity of the life craft.

Model scale experiments on an evacuation system were performed from a fixed platform at the Institute for Ocean Technology (IOT), Offshore Engineering Basin (OEB) during January 2002. A conventional twin-falls davit evacuation system fitted with a flexible boom was used to deploy a Totally Enclosed Motor Propelled Survival Craft (TEMPSC) from a fixed platform into wind and wave conditions ranging from calm to storm conditions.

The experiments involved the investigation of the performance of the evacuation system in seas ranging from Beaufort 0 (calm) to Beaufort 8 (fresh gale) equivalent. Particular attention was focused on the effects of TEMPSC loading conditions (either 100% or 70% capacity), TEMPSC orientation, intact versus damaged installation, direction of weather relative to launch, use of flexible boom or davit system alone, wave type (regular or irregular) and wave steepness. The results of 404 deployments are presented.

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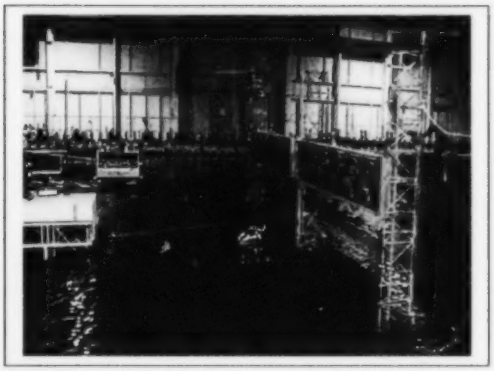

Record Number: 125

Research Category: TECHNOLOGY

Improvement Reference: Marine Evacuation Systems Research

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 107

Effective Date: 2003

Title: Escape, Evacuation and Rescue Project: Offshore Evacuation Systems

Author: A. J. Simões Ré

Description:

This presentation document summarizes the activities to date conducted in support of developing the performance criteria for a more reliable evacuation system for the offshore energy industry. Goals included:

- Evaluation of lifeboat evacuation system capabilities as a function of weather conditions
- Develop and formulate performance measures so that they will have practical utility in the context of Performance Standards and Goal-Setting Regulation

The model-based research work conducted to date has examined many facets of weather condition capabilities and has established a baseline of performance measures by which various systems may be compared.

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Graphic Not Available

Record Number: 126

Research Category: TECHNOLOGY

Improvement Reference: Development of a Computer Program to Estimate Reliability of Evacuation Systems

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: May 2004

Title: Assessment of the Reliability of Marine Installation Escape, Evacuation And Rescue Systems and Procedures

Author: F.G. Bercha; M. Cerovsek; W. Abel
Presented: 14th International Offshore and Polar Engineering Conference, 2004

Description:

This paper describes an analysis system developed for the assessment of reliability and performance characteristics of different escape, evacuation, and rescue (EER) components and their integrated performance as an EER system for different offshore installations and operating conditions. A computerized Probabilistic EER simulator (PEERS), in its fourth version called the Risk and Performance Tool (RPT), uses an optimal combination of risk analysis and simulation. Essentially, the RPT simultaneously models the evolution of risks and times of performance for each of the activities, operations, and components, comprising an EER process under given operational, environmental, and accident conditions.

In this paper, following a detailed description of the methodology utilized in the development of the RPT including the basis for input data, algorithms, and results, several typical offshore EER configurations for different conditions are analyzed and representative results are presented.

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No Graphic Available

Record Number: 127

Research Category: TECHNOLOGY

Improvement Reference: Seascape System Full Scale Trials in Newfoundland

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: Fall 2004

Title: Seascape Life Rescue Craft and Full Scale Testing

Journal: Oceanic Consulting Corporation "Making Waves", Edition Fall 2004

Description:

Seascape has built a vessel prototype and a land-based installation for demonstrating the company's unique offshore evacuation method.

The Seascape System of Evacuation (SSE) consists of three major components: the Life Rescue Craft vessel (LRC), the deployment arm and fall arrestors. For full scale testing and demonstrations, a supporting tower structure was built to represent the platforms on which the SSE would be mounted.

The LRC, is a 70-person, 12.8m aluminum-alloy vessel powered by twin turbo-charged diesel engines. It is installed to point away from the platform and is mechanically pivoted at the end of the deployment arm so that during launch zero degree trim is maintained at all times. The deployment arm guides the LRC from the stowed position atop the SSE to a fixed distance away from the installation at water level. Specialized winches and hydraulic fall arrestors provide a controlled deployment of the LRC and the deployment arm during launch, and also facilitate retrieval. The winch and fall arrestor rely solely on gravity, requiring no external power for launching.

In the previous performance evaluation carried out for Seascape, Oceanic conducted resistance, self-propulsion, and seakeeping tests on the LRC.

Since construction of the vessel, Seascape has continued to successfully demonstrate the capability of the design in operation including maneuvering in ice.

In the most recent round of testing, Oceanic has mounted an accelerometer array (three accelerometers mounted in orthogonal directions) in the LRC to record acceleration measurements, collect acceleration data during launch of the vessel, and report acceleration statistics during launch and splashdown.

The data generated during the testing will be used in refining the existing design and fine tuning the operation of the launching arm.

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Record Number: 128

Research Category: TECHNOLOGY

Improvement Reference: Analysis of Computer Predictions of Free Fall Lifeboat Behaviours

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 107

Effective Date: 2004

Title: Computer Simulation of a Freefall Lifeboat Evacuation System in a Range of Initial Conditions

Author: Bradley Elliott, Institute for Marine Dynamics

Description:

This report describes a systematic study aimed at establishing the capabilities of evacuation systems installed on offshore structures as a function of installation conditions, and load capacity of the life craft.

Using the U.S. Department of Commerce, National Technical Information Service Lifeboat Analysis System (LAS), it was possible to predict the behaviour of a freefall lifeboat deployed from a freefall ramp evacuation system located on a fixed platform into calm weather conditions.

The simulations involved the investigation of the behaviour of a freefall lifeboat from when the lifeboat is released to the time it enters the water. Weather conditions were not a factor, so seas remained at Beaufort 0 (calm). Particular attention was focused on the effects of survival craft longitudinal centre of gravity (LCG) conditions (either forward or aft), ramp length, and ramp angle.

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Record Number: 129

Research Category: TECHNOLOGY

Improvement Reference: Determination of Operational Weather Limits of TEMPSC

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 22

Effective Date: 2004

Title: Escape, Evacuation and Rescue Survivability Testing

Author: Colin Power, Institute for Ocean Technology

Description:

Experiments at the Institute for Ocean Technology establishing the operational weather limits of TEMPSC.

As offshore petroleum exploration in Canadian waters grows continuously, the need for improved offshore safety rises also. The unique weather conditions (wind and waves, cold temperatures and ice) off the Canadian coast must be addressed.

As part of the Escape, Evacuation, and Rescue team, experiments conducted at the Institute of Ocean Technology established the operational weather limits of Totally Enclosed Motor Propelled Survival Craft (TEMPSC).

To do this, model survival crafts were used to perform typical tasks in a controlled environment of wind and waves in the Offshore Engineering Basin. Although the data and results have not yet been analyzed, several preliminary conclusions can be drawn.

The MadRock model seemed to have better maneuvering in the weathers than the other two models. Also, it was found that the greatest setback occurred when the models were launched on troughs and up slopes. It is recommended that the research team improve the design of the model launch system to allow the models to experience their natural motions without influence from the current system. It is also recommended that the wind machines be upgraded to minimize swirling.

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No Graphic Available

Record Number: 130

Research Category: TECHNOLOGY

Improvement Reference: Evaluation of TEMPSC Behaviour in Ice-Covered Waters

Area of Impact: Canada

Organization Category: Research

Royal Commission Recommendation: 22 & 107

Effective Date: 2004

Title: Graphical Analysis: Lifeboat Evacuation Test Program in Ice

Author: C. Power, Institute for Ocean Technology

Report: Laboratory Memorandum LM-2004-29

Description:

Establishing performance limits for conventional lifeboats in ice. Variables tested were the concentration, thickness and size of the ice floes, as well as the effect that additional power had on the lifeboats' performance.

In an event of an emergency situation on an offshore vessel or installation, the evacuation must occur in the conditions that prevail at the time of the emergency. Very little, to date, is known about the effects of ice conditions on the performance of a lifeboat in an evacuation.

In 2003, Research Officers Antonio Simões Ré, and Dr. Brian Veitch headed an experimental study with the purpose of establishing performance limits for conventional lifeboats in ice. The variables tested were the concentration, thickness and size of the ice floes, as well as the effect that additional power had on the lifeboats performance. Testing involved the operation of a 1:13 model scale lifeboat inside the Institute for Marine Dynamics ice tank.

This wide scope of research involved multiple other smaller analysis projects, including the analysis of the path length and time required for the lifeboat to reach certain critical boundaries from danger.

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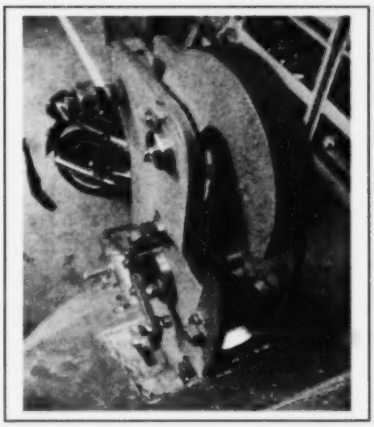


Record Number: 131

Research Category: TECHNOLOGY

Improvement Reference: Lifeboat Release Hook System

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 22 & 107

Effective Date: June 2005

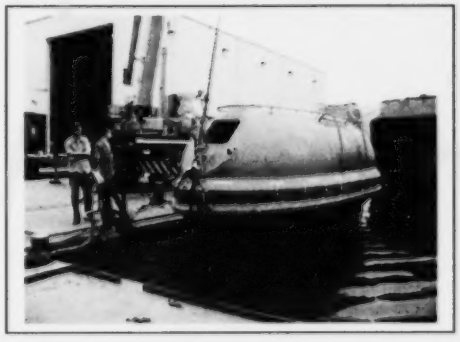
Title: RocLoc Lifeboat Onload Release Hook Gains DnV Type Approval

Author: Pelley, Dean

Description:

Mad Rock's new lifeboat release mechanism, the RocLoc 6, is designed to be easy to maintain; simple to understand and operate; very stable under a wide range of loading conditions and equipped with superior failure warning characteristics. Throughout the development process, Mad Rock received input from offshore oil operators, seafarers, training instructors and lifeboat service agents to ensure that the lifeboat hook was ergonomic, and easy and safe, to use.

Hook prototypes were rigorously tested in state-of-the-art test laboratories. All aspects of operation were investigated including abnormal loading and usage situations. Based upon the research and full scale testing conducted, the RocLoc 6 is Canadian and SOLAS approved, and the RocLoc 6 lifeboat release mechanism can be retro-fitted onto existing twin fall lifeboat systems.



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Record Number: 132

Research Category: TECHNOLOGY

Improvement Reference: Scale Model Trials of Arctic-Capable TEMPSC

Area of Impact: Canada

Organization Category: Industry

Royal Commission Recommendation: 107

Effective Date: February 2005

Title: Polar Haven Arctic-Class Lifeboat

Author: Pelley, Dean

Description:

The Polar Haven lifeboat is an extreme environment concept lifeboat that can operate in ice. Based on the Mad Rock Haven Lifeboat design, the Polar Haven has been extensively model scale tested in ice conditions.

The Haven lifeboat design was developed to have superior maneuvering capabilities, provide coxswains with 360° visibility and obstacle avoidance during darkness or low visibility, and reduce sea sickness. The lifeboat design has been model tested in various weather conditions up to Beaufort 8. Ideally suited for areas with extreme weather events such as hurricanes and typhoons, the Haven is designed to be extremely reliable.

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Record Number	133
Research Category:	PROCEDURES
Improvement Reference:	Advisory Group on Evacuation Systems and Procedures
Area of Impact:	International
Organization Category:	Government
Royal Commission Recommendation:	N /A
Effective Date:	June 2005

Title: Evacuation, Escape and Rescue Technical Advisory Group (EERTAG)

Author: Health & Safety Executive

Description:

The Advisory Group's range of technical interests encompass equipment and procedures to be used in EER from on-platform events or from external events such as ship collision. The Group's interests therefore include arrangements for alarm systems, access to the muster point or the Temporary Refuge, evacuation, escape direct to the sea and rescue and recovery to a place of safety.

The principal aims of the Group are:

(i) Identify, compile and develop technical information on EER arrangements for offshore installations.

(ii) Publish and disseminate that information within the offshore industry to enable improvements in EER capabilities.

(iii) Provide information for suppliers, designers, operators and owners to take account of when developing their EER arrangements.

(iv) Advise the industry and associated regulators on areas where further research and guidance may be needed.

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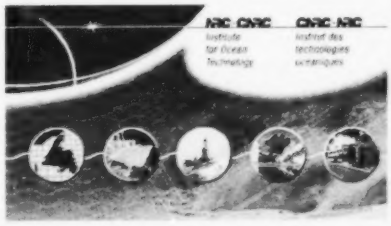

Record Number: 134

Research Category: TECHNOLOGY

Improvement Reference: Evacuation Systems (Release Gear)

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 107

Effective Date: September 2005

Title: Lifeboat Release Mechanism Testing

Author: NRC – Institute for Ocean Technology

Description:

In a physical testing study commissioned by Transport Canada, two lifeboat release mechanisms were tested to identify the root cause of accidents involving premature hook release. Lifeboat hooks that were tested had regulatory certification. The first hook tested was a new design. The second hook tested had been in use for 12 to 15 years.

The functional tests performed included:

- On-load tests (as required by regulation)
- Static tests – load on the release cable was measured at various cam angles (simulating an improperly re-set hook) with the appropriate working load applied to the hook.
- Cyclic Loading – the load on the release cable was measured with a cyclic applied load to the hook to simulate the wave and wind action on the lifeboat
- Damaged Cable – the hook was loaded with the release cable detached from the cam.

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Record Number: 135

Research Category: STANDARD

Improvement Reference: Joint Marine Abandonment and Constant Wear Immersion Suit

Area of Impact: Canada

Organization Category: Government

Royal Commission Recommendation: 109

Effective Date: November 2005

Title: Immersion Suit Systems

Author: Canadian General Standards Board

Description:

This standard integrates the performance characteristics of the Marine Abandonment Immersion Suit and the Constant Wear Immersion Suit, establishing new design performance standards for manufacturers who desire to market a dual-use immersion suit.

This standard applies to suit systems that

- reduce thermal shock upon entry into cold water
- delay the onset of hypothermia during immersion in cold water
- provide acceptable flotation and minimize the risk of drowning
- do not impair the wearer's ability to perform fundamental survival actions; and
- in the case of constant wear suits, do not impair the wearer's ability to perform normal working duties.

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